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UTEROSALPINGOGRAPHY

[THIRD COMMUNICATION]

SAFETY OF THE METHOD, COMPILATION OF REPORTS OF UNTOWARD RESULTS, CONTRAINDICATIONS, SURVEY OF RECENT LITERATURE, DISCUSSION OF TECHNIQUE AND THERAPEUTIC APPLICATIONS, AND A NEW SYRINGE WITH MANOMETER ATTACHMENT*

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IN two previous communications[1] on uterosalpingography, published in *Surgery, Gynecology and Obstetrics*, I attempted to give a comprehensive description of this new and important subject. In the first paper, the history of the diagnostic use of iodized oils, first as a means of localizing spinal cord tumors and other causes of intraspinal obstruction and later for the roentgenological visualization of the female internal generative organs, was epitomized. Also, my technique of employing the method and certain typical cases were reported. The second article dealt largely with the action of the "tubal sphincter," a new syringe for transuterine injections and therapeutic applications of uterosalpingography.

In this paper, the third of my series on uterosalpingography, I propose to discuss the alleged dangers of the method, formulate the contraindications, review the additional literature that has appeared since my second article was submitted for publication near the end of 1927, and describe certain technical details and the instrument with manometer attachment which I now use in all cases.

SAFETY OF UTEROSALPINGOGRAPHY

Many gynecologists have been deterred from utilizing uterosalpingography for fear that they might provoke some unfavorable reaction by injecting the iodized oil. If we are to accept uterosalpingography as a standard procedure, we must have a clear conception of its contraindications as well as its indications. To this end, I have made an exhaustive study of the literature for the purpose of compiling reports of untoward results. As will be shown presently, ill effects have been surprisingly few, considering the large number of cases in which the method has been employed.

For my part, I have observed no ill effects other than two cases of acne and am convinced that the method is entirely safe when used in properly selected cases, with good technique and by experienced operators. For theoretical reasons, however, I am inclined to discourage its use in certain conditions.

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Pregnancy, I believe, should serve as a contraindication, unless therapeutic abortion is contemplated. Although Heuser[2]

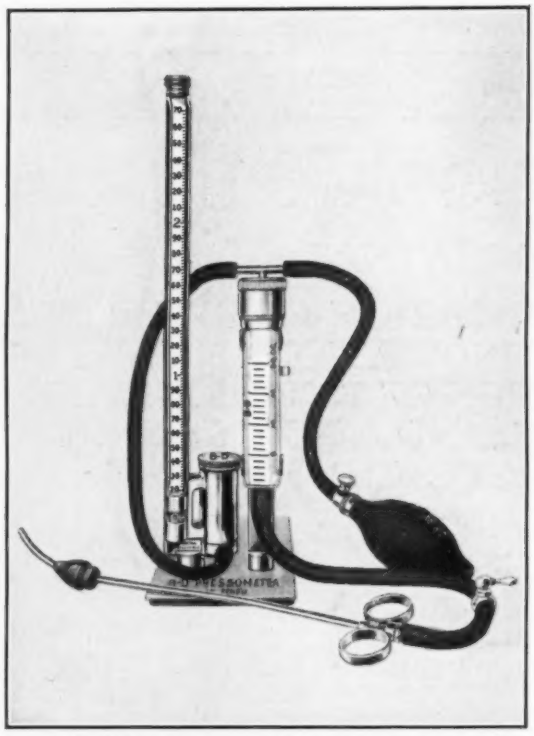

Fig. 1. Author's apparatus with manometer attachment for uterosalpingography. It shows exact amount and pressure of iodized oil injected.

in 1925 contended that the injection of iodized oil does not produce abortion, a number of recent investigators have reported this accident in a definite percentage of cases. Moreover, one should be deterred by the possibility that it may damage the offspring. Until it is proved conclusively that this danger does not exist, I do not intend to employ uterosalpingography in the gravid state unless therapeutic abortion is intended.

Uterosalpingography has been employed for the localization of malignant growths in the uterus. I am opposed to this procedure, because I fear that it may transport cancer cells through the Fallopian tubes into the peritoneal cavity and thus hasten general dissemination.

Gonorrhea and conditions of acute tubal inflammation are, I believe, contraindications, for the reason that there is danger of carrying the infective material upward along the genital tract and perhaps into the peritoneal cavity. For the same reason, I do not favor the use of uterosalpingography during the menstrual period or for the diagnosis of retained secundines.

Does the injection of iodized oil produce peritoneal adhesions? This question, I am convinced, can be answered in the negative. I have operated upon a number of women after uterosalpingography, sometimes within twenty-four hours, and observed no evidences of peritoneal irritation. Also, there was no deleterious influence on the postoperative course or interference with the healing of the wound. Cases of this nature are illustrated in Figures 4, 13, 14 and 27. In a number of cases the uterosalpingograms proved the patency of the tubes and the presence of free oil in the peritoneal cavity; yet there was not the slightest indication of peritoneal irritation at operation performed twenty-four hours after the injection.

No toxic effects of iodine were observed even after injections of 20 c.c. of the oil. In such cases, assuming that 5 c.c. drain from the uterus, 15 c.c. are retained in the Fallopian tubes and peritoneal cavity. Another possibility is that some of the oil is gradually propelled back from the tubes into the uterus and then drained into the vagina. This supposition is supported by the fact that some patients assert that for days afterward they have an oily discharge with the characteristic odor.

Although my own experience has been that uterosalpingography, properly employed, is free from danger, I have made an extensive review of the literature on this point. As a result, I can report that the great majority of investigators have found the procedure entirely safe. However, there are a few exceptions, which should be noted.

Cotté and Bertrand[3] in 1926 reported that they had used iodized oil for diagnostic purposes in more than 50 cases of acute or subacute inflammation of the

Fallopian tubes and had never noted a rise of temperature or any unfavorable reaction due to the introduction of the oil. In the reported on the use of iodized oil for uterosalpingography in more than 100 cases, in none of which there was any

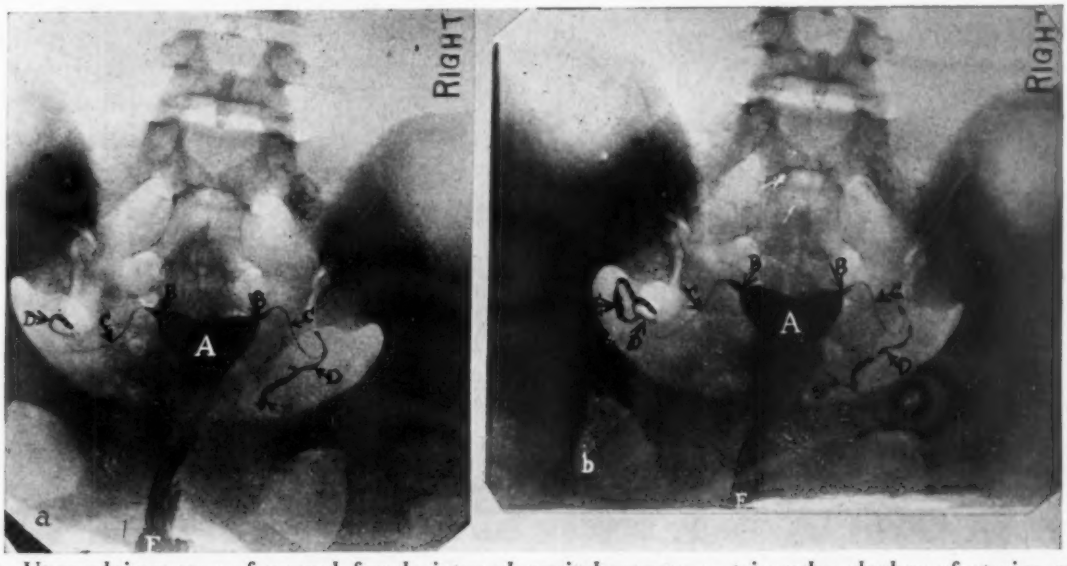

Fig. 2. Uterosalpingogram of normal female internal genital organs. A, triangular shadow of uterine cavity; B, snare-like compression of tubal sphincter; C, isthmus of Fallopian tube; D, beginning of ampulla; E, free iodized oil in peritoneal cavity; F, nozzle and tip used for introducing oil into uterus.

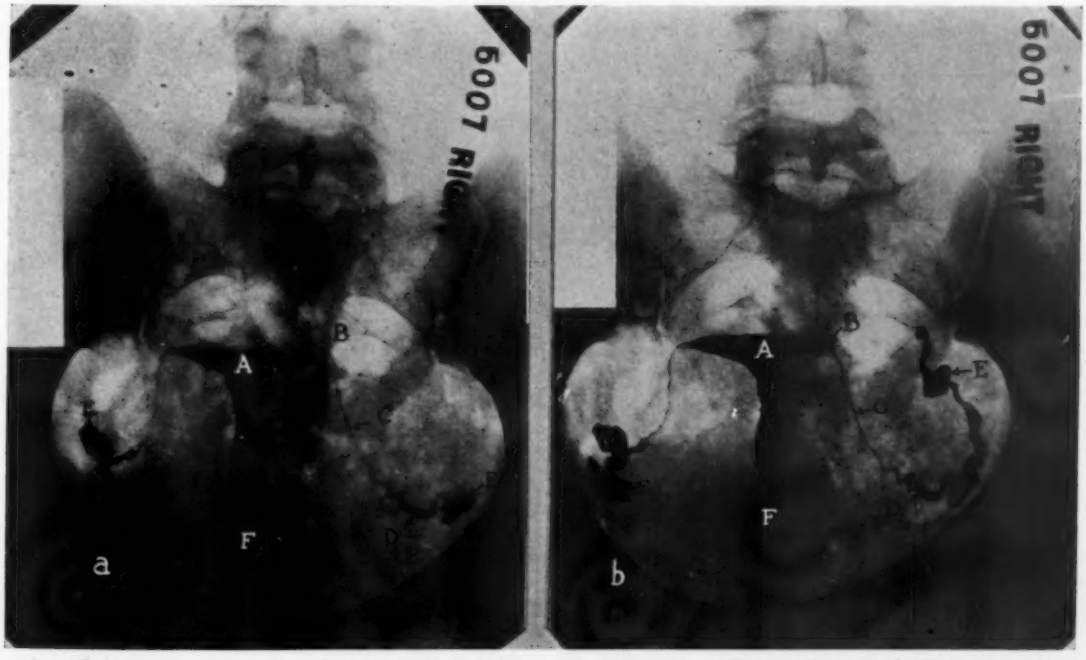

Fig. 3. Anteflexed uterus, showing foreshortening of its vertical diameter. (For explanation of letters compare with Fig. 2.)

same year, Cotté and Pièrre[4] reported that they had given intrauterine injections of iodized oil in 20 cases of acute adnexal inflammation without harm.

More recently, Darbois and Béclère[5] reaction, sign of peritoneal irritation, or spread of the infection. Yet 30 of these patients had salpingitis at the time when the procedure was employed.

Henkel[6] reported that he had never

observed any untoward results or symptoms of irritation following injections of iodized oil. Also, in patients upon whom he operated subsequently, he found no evidences of such irritation in the Fallopian tubes or peritoneum.

Jaroschka[7] reported that he had observed no serious reactions from injections of iodized oil although patients sometimes complained of pain. Popović[8] employed uterosalpingography extensively without observing any ill effects whatsoever.

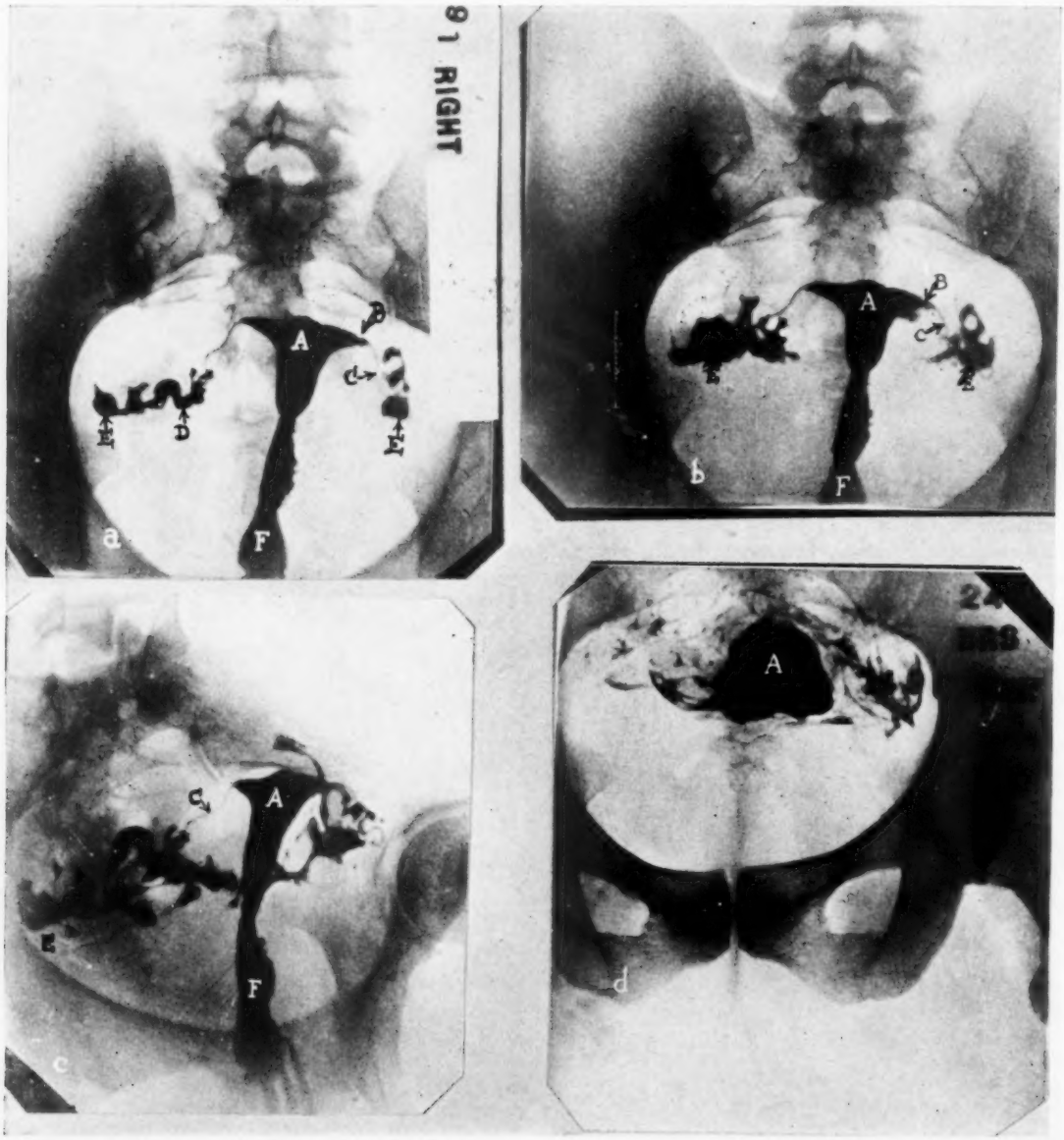

Fig. 4. Retroflexed uterus, replaced anteriorly and injected with iodized oil. Three months later, a modified Gilliam operation was performed. No signs of adhesions or pelvic irritation due to uterosalpingography were found. (For explanation of capital letters compare with Fig. 2.)

a, b. Normal uterine shadow with large amount of oil in peritoneal cavity.

c. Lateral prone position.

d. Twenty-four hours after injection.

As soon as instruments were withdrawn, uterus fell backward. Because of marked retrodisplacement, oil did not drain off.

Patient was a married woman, aged twenty-six, who complained of primary sterility (three years). Uterus was retroflexed but movable; adnexa, negative.

Temesváry[9] reported that he had never seen signs of peritoneal irritation after injections of iodized oil. In 35 cases in which operation was performed from several days to several weeks after uterosalpingography, there was not the slightest sign of peritoneal irritation.

Greene and Pendergrass[10] employed uterosalpingography in about 50 cases, in none of which there was any evidence of reaction or untoward effect, either immediate or delayed. On the contrary, there was definite improvement in some of their patients with chronic salpingitis.

Mocquot and Bureau[11] have never observed ill effects from injections of iodized oil even when it entered the peritoneal cavity. They employed the method in about 150 cases. In cases in which they operated after uterosalpingography, they found no evidence of irritation of the epithelium of the Fallopian tubes or of the peritoneum. However, they believe that uterosalpingography is contraindicated during uterine bleeding, in acute infectious and severe suppurative processes, and when pregnancy is suspected.

Schultze[12] employed uterosalpingography in over 200 cases in the gynecologic clinic of the University of Berlin without observing any ill effects.

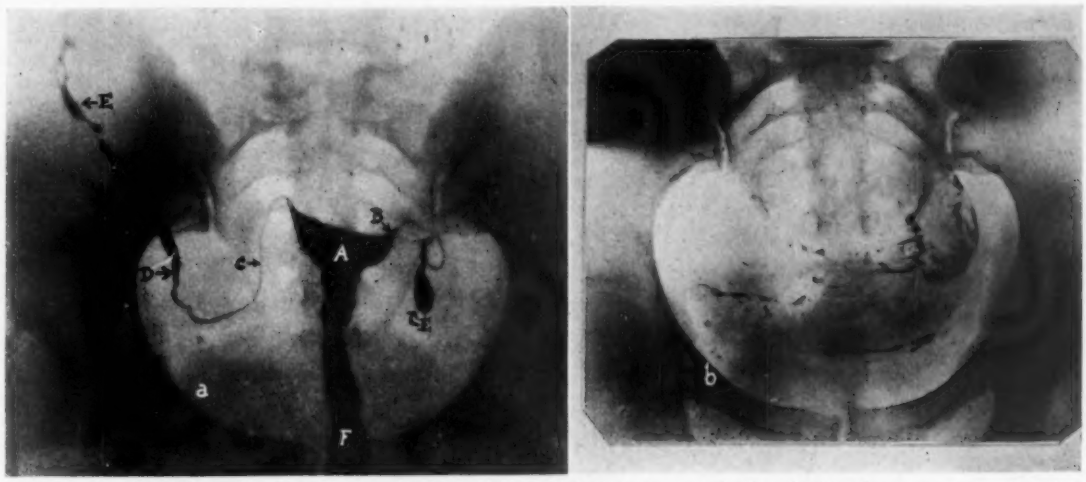

Fig. 5. Patency of Fallopian tubes restored after repeated injections of iodized oil. One year previously, both tubes were occluded. (For explanation of capital letters compare with Fig. 2.)

a. Fallopian tubes high in pelvis and atonic uterine cavity.

b. Free oil in peritoneal cavity, proving that tubes are patent.

Patient was thirty-two years old and complained of secondary sterility. She had been married twelve years and had a child of eleven. Following removal of a left ovarian cyst eight years previously, her menses became scant and infrequent. Uterus was found to be small and anteflexed but freely movable. Uterine cavity accomodated 15 c.c. of iodized oil notwithstanding its small size, indicating atony of uterine musculature. First uterosalpingogram revealed occlusion of both Fallopian tubes at their cornual ends.

In more than 150 cases in which they employed uterosalpingography, Zimmermann and Nahmmacher[13] never found the slightest evidence of irritation or inflammation of the epithelium caused by this medium, nor of peritoneal irritation or toxic effects. Moreover, in experiments on guinea pigs, they found that intraperitoneal injections of iodized oil caused no symptoms of peritoneal irritation and the contrast medium did not cause abort on or affect pregnant animals unfavorably.

In about 170 cases in which uterosalpingography was employed in the gynecologic clinic of the University of Jena, Nahmmacher[14] observed no ill effects. A follow-up study of some of these patients showed that neither pain attributable to inflammatory reaction or adhesions nor any other unfavorable symptoms had developed.

With regard to the safety of lipiodol for gynecologic diagnosis, Forestier[15] made the following significant statement: "No serious accidents have resulted from the

different uses of lipiodol in our hands and we have performed thousands of injections. No fatality has ever been reported.

Fig. 6. Glassful of water into which iodized oil has been squirted from a syringe. Note that heavier oil sinks to bottom and arranges itself there in droplet formation.

The method may be advocated as effective in many cases and quite harmless."

Gauss[16] reviewed the literature on uterosalpingography up until 1928 and found that about 3000 cases in which the procedure was used had been reported. In this series, there were 5 deaths attributed to the method and 13 cases in which infection followed. This is not a large percentage, particularly since in some cases the author's conclusion as to the blame to be placed upon the iodized oil was based on subjective impression rather than objective proof.

Specific reference will now be made to the work of some authors who have observed unfavorable effects following uterosalpingography.

According to Proust and Béclère,[17] such untoward reactions as have occurred after uterosalpingography took place when contrast media other than lipiodol were used. (But in Rubin's[18] unfavorable cases, recently reported, lipiodol was used.) Proust and Béclère cite Hellmuth's[19] fatal case, which followed the injection of umbrenal. They employed lipiodol in 70 cases, including 30 with salpingitis, and did not observe the slightest reaction. There was no rise of temperature or sign of peritoneal irritation, notwithstanding the fact that the contrast medium penetrated infected tubes in many cases.

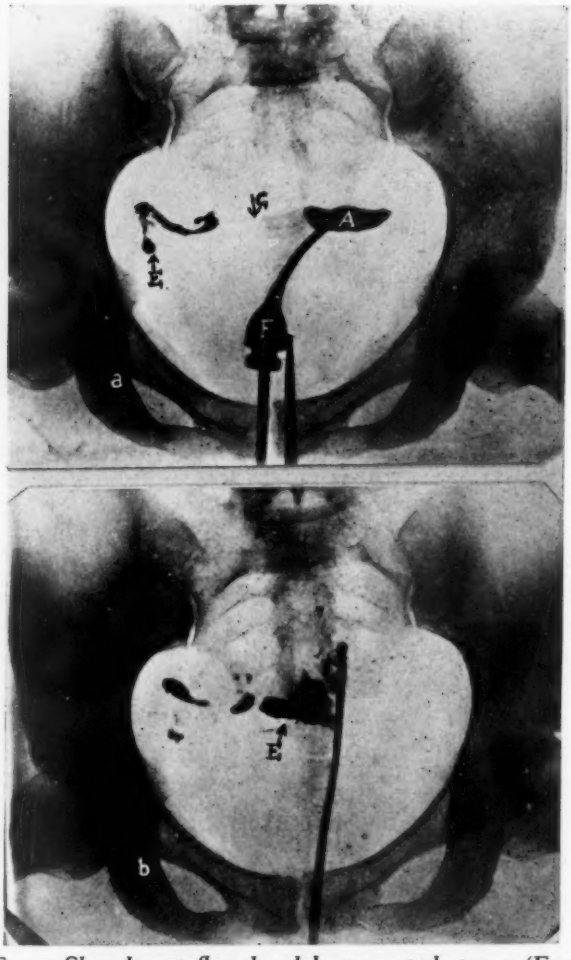

Fig. 7. Sharply anteflexed and dextroverted uterus. (For explanation of capital letters compare with Fig. 2.)

a. Summit of fundus uteri (A) presents itself to view. Right Fallopian tube is occluded at cornu. Left is adherent and greatly elongated.

b. After iodized oil had been allowed to drain off, a sound was introduced to orient position of uterus. Note that it is directed to right, corresponding with position of dextroversion shown in *a*. There is no shadow corresponding with right Fallopian tube, proving that condition is really one of occlusion and not of a patent tube hidden behind uterine shadow. Left tube is evidently held in adhesions, as is shown by droplet formation of oil in peritoneal cavity.

Patient was twenty-nine years old and complained of sterility. She had been married four years and had one abortion three years prior to examination, but no children. Uterus was small, sharply anteflexed and dextroverted and the cervix was directed downward and forward. Adnexa were thickened and tender.

Further course of this case is shown in Figures 8 and 9.

Rubin and Bendick[20] believe that they

have observed signs of peritoneal irritation in a few cases in which iodized oil entered the peritoneal cavity, but the patients were never too ill to visit the office on the following day.

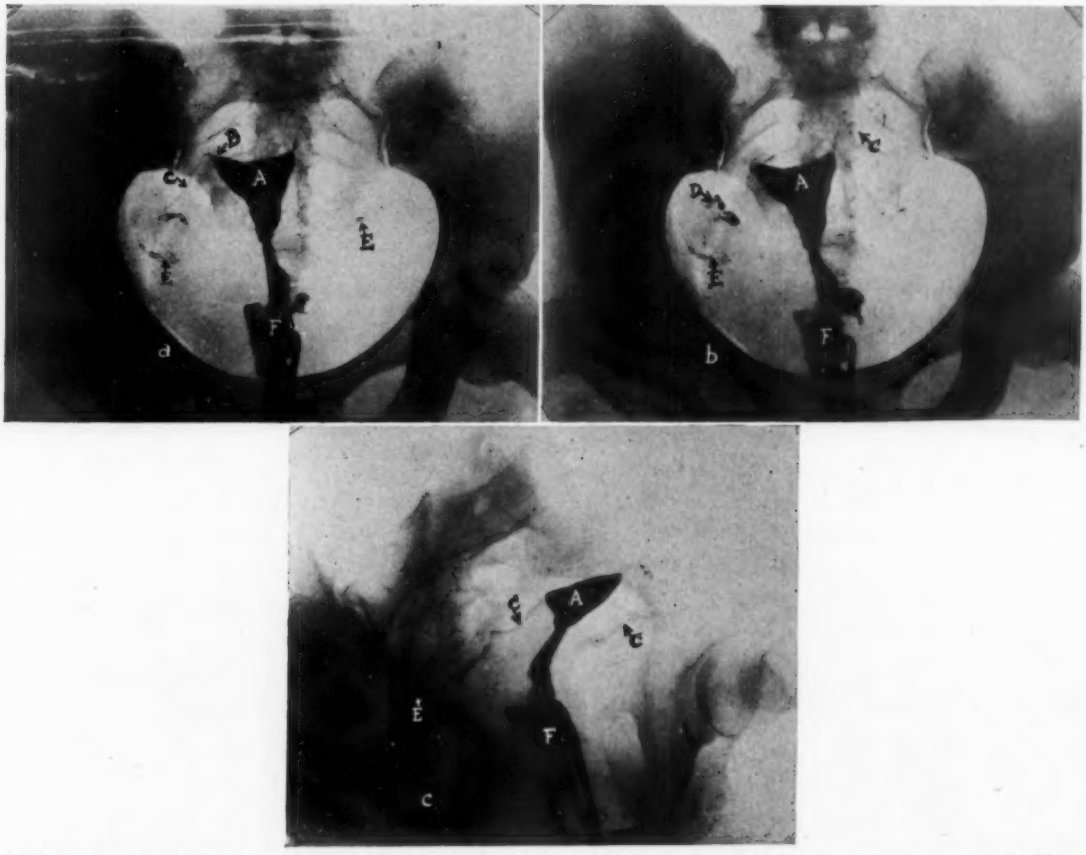

Fig. 8. Same case as Figure 7, three months later. (For explanation of capital letters compare with Fig 2.) It required 3.5 c.c. of iodized oil to obtain this salpingogram.

a, b. Small triangular shadow of uterine cavity is now centrally located, both tubes are patent, and there is free oil in peritoneal cavity. Fallopian tubes are not only patent but have regained their normal contour. Note successive filling and emptying of various portions of tubes.

c. Lateral prone position.

Further course of this case is shown in Figure 9.

In a series of 66 cases in which uterosalpingography was employed, Rubin[18] observed large pelvic abscesses requiring incision and drainage in 2 cases and symptoms of peritoneal irritation (cramps, nausea, vomiting and pain in the lower abdomen) in 3 others. In a case of pregnancy in which therapeutic abortion was indicated, the injection of iodized oil with no other interference produced evacuation of the uterus in a few days.

Hoffmann[21] cited 2 cases reported by Odenthal[22] in which symptoms of inflammatory reaction developed after uterosalpingography. In one of these cases, subsequent operation showed definite evidence of recent inflammation in addition to chronic infection. Hoffmann reported an untoward reaction in 1 case following the use of uterosalpingography for sterility. Symptoms of acute inflammation of the uterus and tubes, not previously observed, developed after this procedure.

Haselhorst[23] reported 2 cases in which injection of iodized oil (iodipin) was followed by pain and fever. The first case was one of ovarian cyst, in which subsequent operation revealed an extensive sterile inflammatory reaction with an exudate involving the Fallopian tubes and adjacent peritoneum. Haselhorst attributed

this condition to the previous uterosalpingography. In the second case, accidental abortion with infection of the uterine contraction induced by the procedure, he has never observed any ill effects from injections of iodized oil. In only 1 case

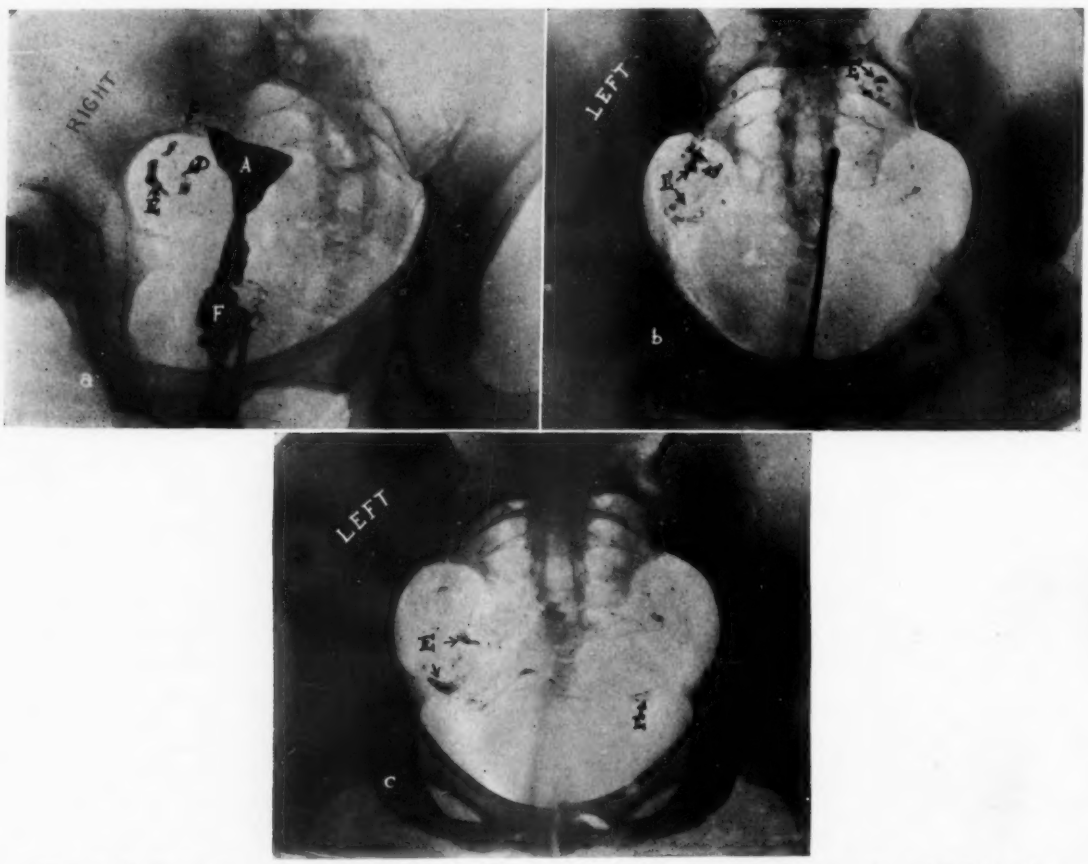

Fig. 9. Same case as Figures 7 and 8. (For explanation of capital letters compare with Fig. 2.)

a. Before removal of nozzle.

b. Immediately after removal of nozzle. A sound has been introduced to orient position of uterus. Uterus had powerful tonus, as was evidenced by fact that oil escaped within a few seconds of time when nozzle was removed from cervix.

c. Normal distribution of iodized oil in peritoneal cavity. Compare with Figure 7.

placenta followed uterosalpingography. Haselhorst believes that, while uterosalpingography is a valuable method of diagnosis, it is not without danger in all cases. Also, he does not consider the presence of free iodized oil in the peritoneal cavity entirely harmless.

Mandelstamm[24] in 1928 reported that in 34 cases in which he employed uterosalpingography rather severe pain resulted, persisting for six hours in one case.

Mathieu[25] reported on the use of uterosalpingography in 80 cases. Although the patient usually experienced slight uterine cramps at the time of injection owing to the was there a rise of temperature. In this case a fever of 101°F. lasted for twelve hours. Approximately 50 per cent of Matheiu's patients were operated upon within five days of uterosalpingography, and in no case was any evidence of peritoneal irritation found.

Hirst[26] noticed an unfavorable reaction in only 1 case after the injection of iodized oil (lipiodol). Operation was performed twenty-four hours after the test and streptococcic infection of the tubes found. The patient later developed streptococcic peritonitis and died. The rôle of the lipiodol in causing this result is questionable. In

21 cases in which both the Rubin test and uterosalpingography were employed, Hirst found that all of the patients stated that on animals showed that no untoward results followed the injection of iodized oil for this purpose. In human cases no

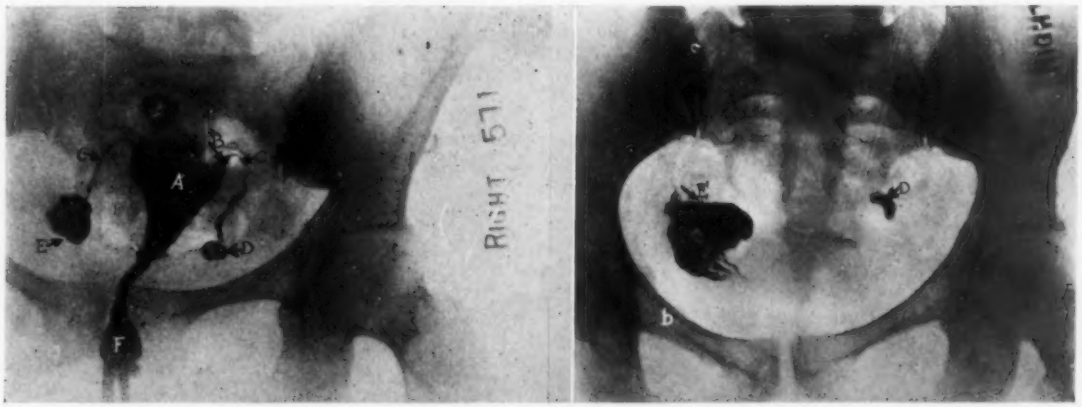

Fig. 10. Fimbriated end of left Fallopian tube embedded in adhesions. (For explanation of capital letters compare with Fig. 2.)

a. Fimbriated end of left tube is embedded in adhesions. Right tube is dilated and closed at its fimbriated end.

b. Oil has broken through adhesions on left side. On right side it is still retained in ampulla.

the injection of iodized oil was the less painful procedure.

Belote[27] reported a case in which an iodine skin reaction developed after the use of iodized oil for roentgenography of the lungs. The eruption developed nine to ten days after the injection of the oil. Examination of the urine and saliva gave a strongly positive reaction for iodine. The patient had not been given iodine in other form except three months previously, when he had taken potassium iodide by mouth. Roentgen-ray examination showed the contrast medium present at the base of the lungs.

In a study of the removal of iodized oil from the lungs after intratracheal injection, Brown[28] found that the presence of the oil in healthy alveoli causes a mononuclear infiltration; that these mononuclears are of the phagocytic type; and that these phagocytes are the chief agents in the removal of the oil from the alveoli of the lungs by way of the lymphatic system. The rapidity of the removal of the oil, he observed, is in direct proportion to the number of active phagocytes.

Neuswanger[29] reported the use of iodized oil as a pyelographic medium. Experiments severe reactions and no signs of toxicity followed its use and the pyelograms obtained were satisfactory.

Taking all the evidence into consideration, we cannot escape the conclusion that unterosalpingography employed in properly selected cases and with strict asepsis and skillful technique is an extremely safe procedure.

Review of Latest Literature

The indications for and information to be gained by uterosalpingography have been covered fully in my two earlier communications. It is not intended to review this material here. However, a large number of communications on the diagnostic use of iodized oil in gynecology have appeared since the latter part of 1927, and some of them contain items of importance which I have not previously mentioned. A brief review of the latest literature on uterosalpingography will therefore be of interest.

Darbois and Béclère[5] have increased the scope of uterosalpingography so as to use it in all cases of sterility for the study of the patency of the Fallopian tubes and the exact localization of any obstruction that may be present; for the diagnosis and

localization of pelvic tumors; and for all types of metrorrhagia, especially at the time of the menopause. However, they advise against its use when uterine hemorrhage is severe, there is a suspicion of pregnancy, or fever is present.

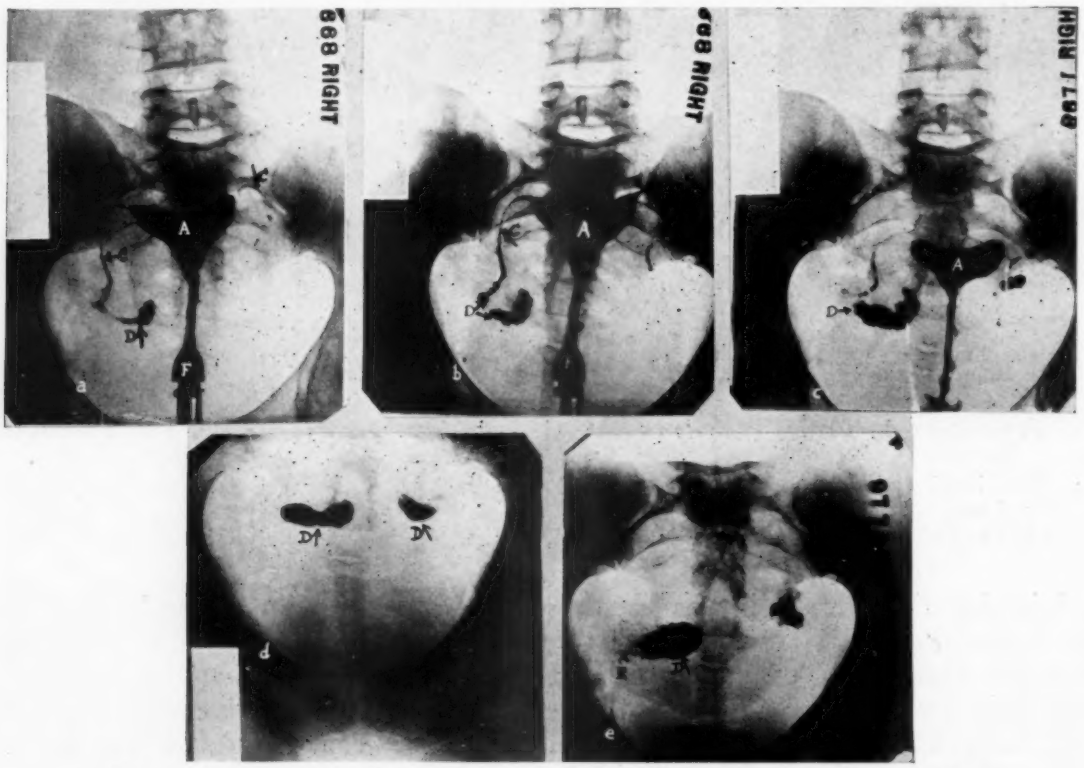

Fig. 11. Atonic uterus. (For explanation of capital letters compare with Fig. 2.)

a, b. Atonic uterus, nozzle retained in cervix.

c. One-half hour later. Nozzle has been withdrawn and a sound introduced to orient position of uterus. Because of atony of uterine musculature, oil has not yet drained off.

d. One week later. Oil is still retained in ampullae of Fallopian tubes.

e. Two months later. Oil appears to be breaking through tubes into peritoneal cavity.

Note droplet formation of oil in Fallopian tubes in this series. This condition is diagnostic of hydrosalpinx.

Patient was forty years old and complained of one-child sterility. She had been married eighteen years and had a child sixteen years prior to examination. Appendectomy at twenty-nine. Insufflation with gas three months prior to uterosalpingography made her very sick for ten days with fever and abdominal pain. Uterus was of normal size. Adnexa were thickened but not tender. Smears from meatus and cervix were negative for gonococci.

Haselhorst[23] has employed uterosalpingography in about 100 cases and found it useful for the diagnosis of inflammatory processes and uterine anomalies, investigation of the condition of the Fallopian tubes in sterility, and study of the results of operations on the tubes. He advises against its use in pregnancy and does not consider it necessary for the diagnosis and localization of uterine fibromyomata. He has observed that the normal uterus responds to injections of iodized oil by contractions beginning in its lower portion, by which the contrast medium is driven toward the fundus and into the tubes. The tubes, also, show evidence of peristalsis. Chronically inflamed tubes do not, as a rule, fill completely; but, in such cases, they may be filled if the oil is introduced under pressure.

Henkel[6] has found uterosalpingography of especial value for the diagnosis of uterine fibromyomata and their exact localization, also for the control of operative results.

Mathieu[25] has found uterosalpingography of value for the differential diagnosis between ectopic pregnancy and intraligamentous cysts.

Nahmmacher[14] reported 2 cases of

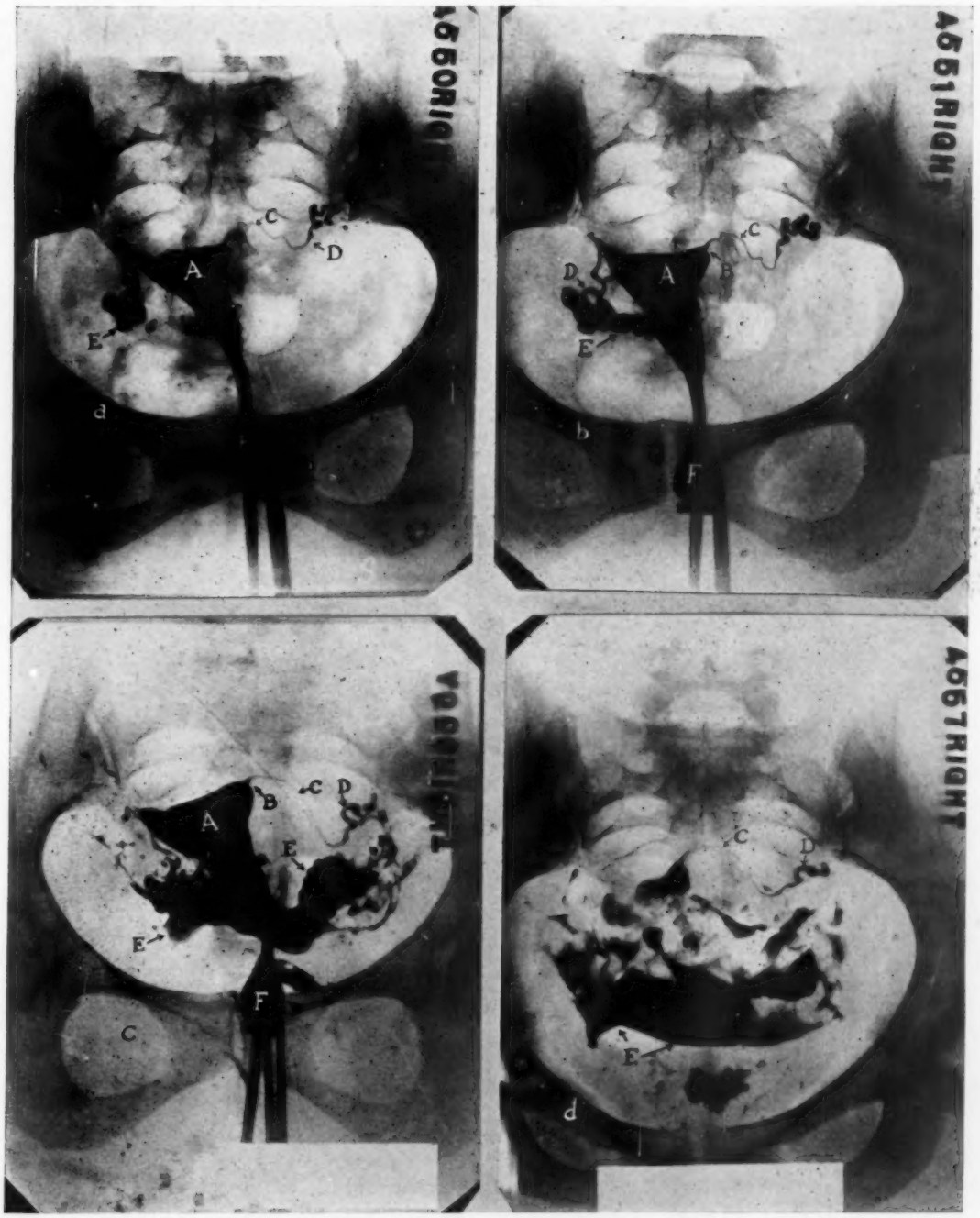

FIG. 12. Atonic uterus. (For explanation of capital letters compare with Fig. 2.)

a, b, c. Left tube is embedded in adhesions posterior to uterus. Note droplet formation of oil around it. Compare relative sizes of uterine shadows in a, b and c.

d. Distribution of oil in peritoneal cavity.

Patient was thirty-two years old, had been married fourteen years and had four children. She complained of backache and pressure in rectum. Uterus was in midposition but displaced somewhat to left. Left adnexa could be felt easily behind uterus and were sensitive to touch. Right adnexa could not be palpated.

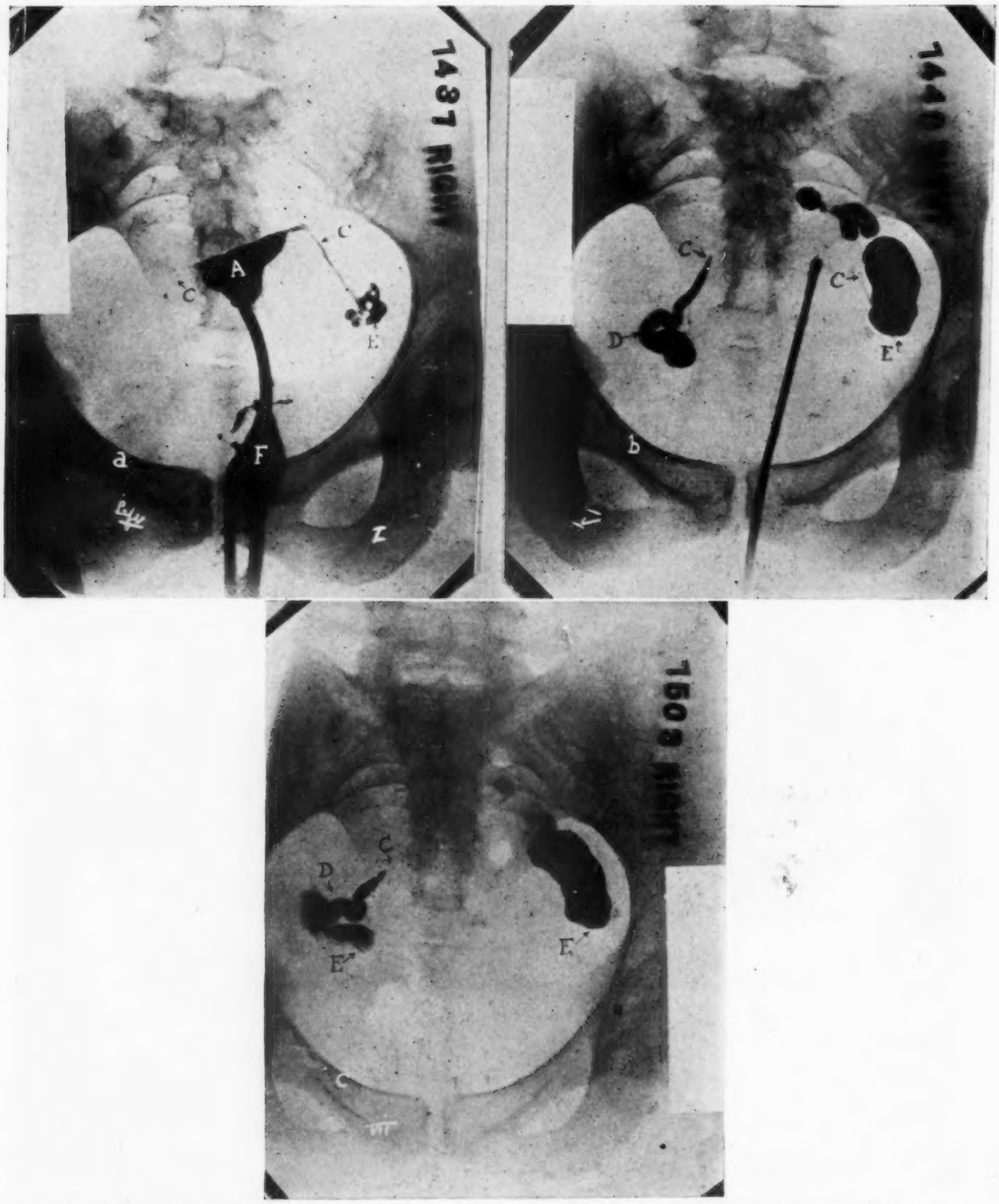

FIG. 13. Retrodisplacement of uterus. (For explanation of capital letters compare with Fig. 2.)

a. Note foreshortened vertical diameter of uterine shadow resulting from displacement. Left Fallopian tube is occluded at isthmus. Fimbriated end of right tube is held in adhesions.

b. After removal of nozzle, a sound has been introduced to orient position of uterus. Reopening of left tube at point of occlusion and droplet formation of oil in tube suggest hydrosalpinx. On right side oil has distributed itself between adhesions around tube.

c. Oil has broken through left hydrosalpinx.

Patient was twenty-eight years old and complained of primary sterility. She had been married four years. Uterus was somewhat enlarged. Anteriorly and to left of it there was a cystic mass. Laparotomy was performed twenty-four hours after uterosalpingography. Left hydrosalpinx and left ovarian cyst were found. Right tube was embedded in adhesions. There were no signs of peritoneal irritation. Postoperative course was uneventful.

Uterosalpingographic findings in this series were corroborated at operation.

urogenital fistula in which iodized oil was injected into the fistula for roentgenologic study of its course. He found that this procedure greatly facilitates correct diagnosis in this condition and is a valuable preoperative guide. There were no ill effects.

Brocq and Béclère[30] have found uterosalpingography of value in distinguishing between uterus bicornis and uterus didelphys. However, they do not consider the v-shaped outline of the uterine cavity as pathognomonic of uterus didelphys.

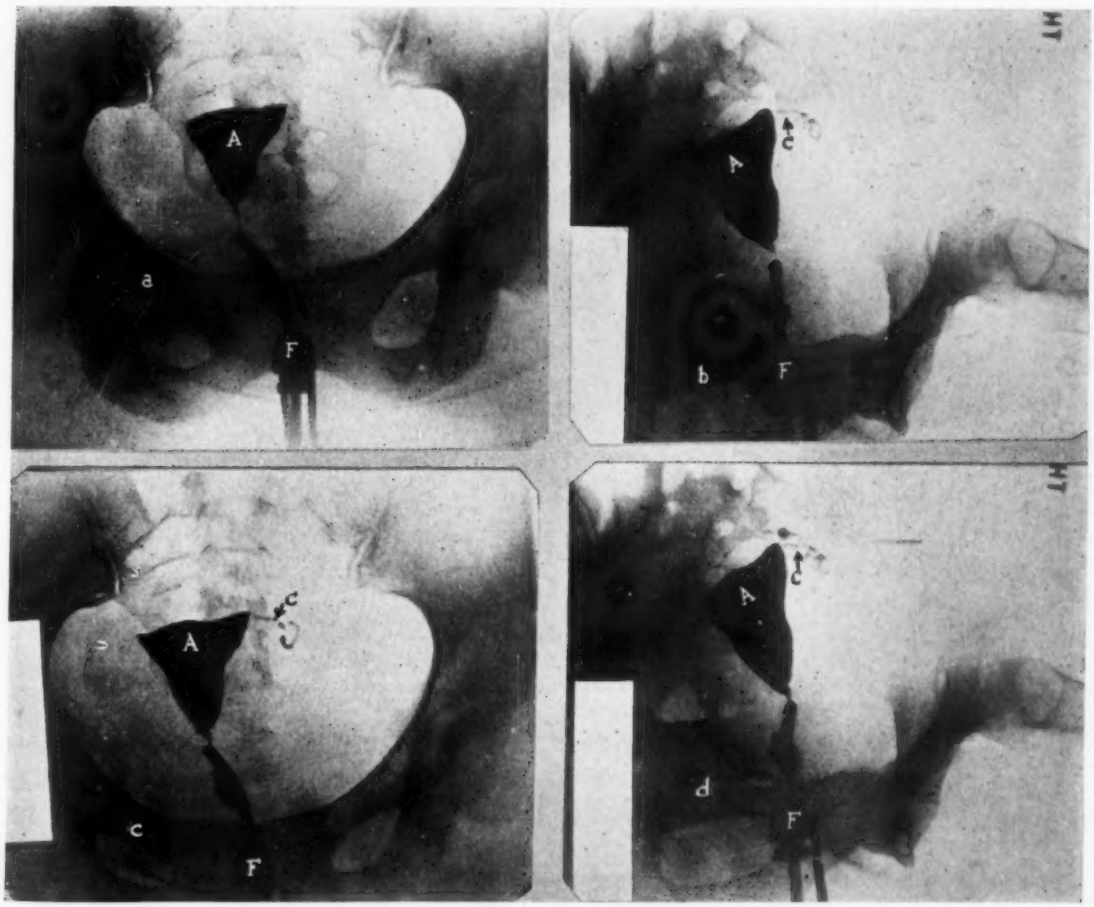

Fig. 14. Atonic uterus. Left Fallopian tube is occluded at uterine cornu. (For explanation of capital letters compare with Fig. 2.)

b, d. Lateral prone position.

A filling defect between nozzle and uterus frequently occurs in uterine displacements.

Patient was thirty-six years old and complained of primary sterility and discomfort in lower abdomen. She had been married sixteen years. Uterus was anteflexed and of moderate size. To its left there was a soft, slightly movable mass, irregular in outline. There was a cystic mass closely adherent to right side of uterus.

Following uterosalpingography laparotomy was performed. There was a right-sided broad ligament cyst closely adherent to right lateral uterine wall so as to produce slight indentation shown in uterogram. Right tube was nodular and closely adherent to cyst. Large varicose veins were found between cyst and pelvic wall. Left tube was dark and very much distended and was embedded in adhesions together with left ovary, which was cystic at its upper pole so as to require partial resection. After resection, tube was found closed at both ends. It contained 16 c.c. of dark fluid, which showed no iodized oil when subjected to chemical examination. There was some free oil in peritoneal cavity, but peritoneum showed no signs of recent irritation.

Operative findings in this case corroborated occlusion of left Fallopian tube shown in salpingogram.

Petit-Dutaillis and Sorel[31] observed that injections of iodized oil may be of definite therapeutic value in cases of chronic salpingitis. They reported 1 case in which complete recovery followed two injections of the contrast medium for diagnostic purposes at an interval of several days.

They consider that the peritoneum as well as the mucosa of the uterus and Fallopian tubes possesses an extraordinary diagnosis of pregnancy occasionally produce abortion. Yet, as they point out, this procedure may find a place in cases

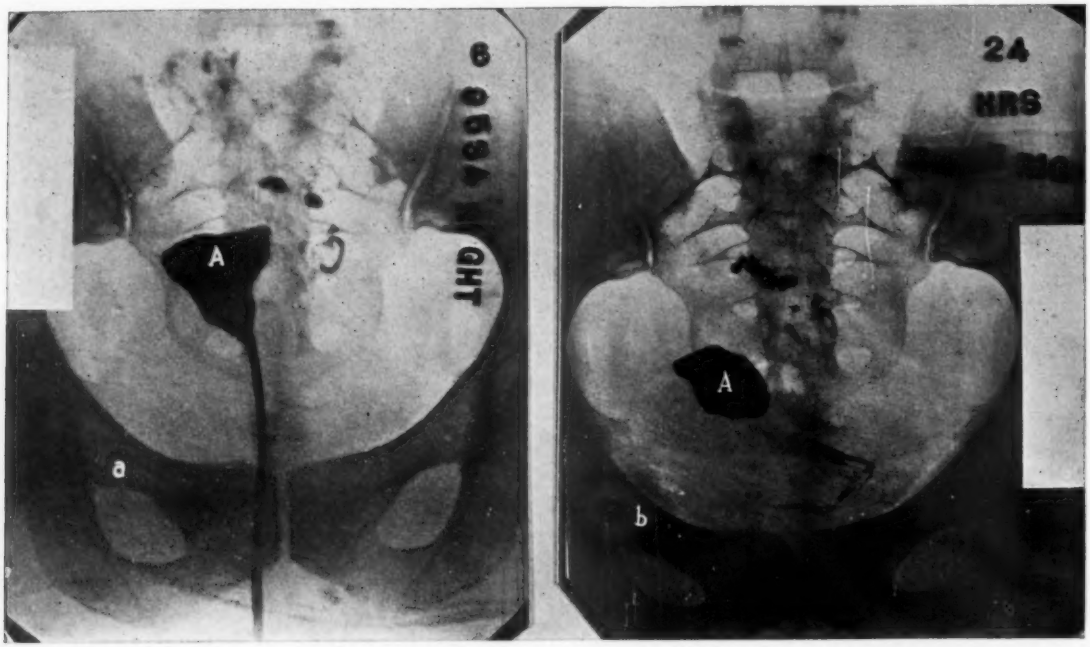

FIG. 15. Same case as Figure 14, after removal of nozzle so as to allow oil to drain off. A, shadow of uterine cavity. Oil is retained in uterus after twenty-four hours because of atony.

tolerance to iodized oil, provided that it is not introduced under forced pressure.

Francillon-Lobre and Dalsace[32] have recently reported 2 cases of sterility in young women in which no other treatment availed but injection of iodized oil for diagnostic purposes was followed by conception and normal pregnancy.

Dryoff[33] has employed colpography, or roentgenological study of the vagina after filling it with a contrast medium, in certain cases in which vaginal palpation was contraindicated, and to determine the capacity, form and tonus of the vagina, especially in pregnancy.

Mitler and Martinez[34] have observed that uterosalpingography employed for the early diagnosis of pregnancy may cause abortion. They used the method in 15 cases. While a positive diagnosis of pregnancy was made in every instance, 3 patients aborted in three to five days afterward.

Rucker and Whitehead[35] observed that injections of iodized oil to make the early in which there is a suspicion of pregnancy and therapeutic abortion is indicated in that event.

Mocquot and Bureau[11] have used injections of iodized oil under slight pressure, controlled by the fluoroscopic screen. They found that, if the tubes are normal, the contrast medium is seen to pass through them and enter the peritoneal cavity in the form of small drops or irregular streaks.

Schultze[12] observed that when the uterus is atonic the shadow of its cavity takes a rounder shape with no sharply defined corners; also, that the tubes do not fill with the contrast medium, even though they are patent and an increased amount of the oil is injected. He has found uterosalpingography of value for the diagnosis of ovarian tumors, in which conditions the uterus is displaced from its normal position and the tube is long and shows no evidence of peristalsis. He considers it valuable also for the diagnosis of submucous fibromyomata and inflammatory

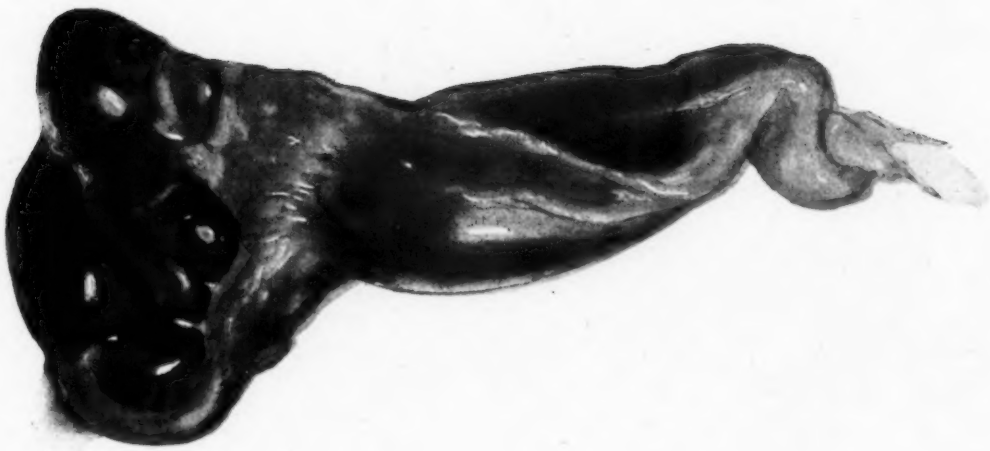

FIG. 16. Left hydrosalpinx, same case as Figures 14 and 15. At operation left Fallopian tube was found to be occluded at both ends and 16 c.c. of dark fluid were aspirated. Chemical analysis revealed no iodized oil, thus corroborating uterosalpingographic findings that tube was occluded at uterine cornu.

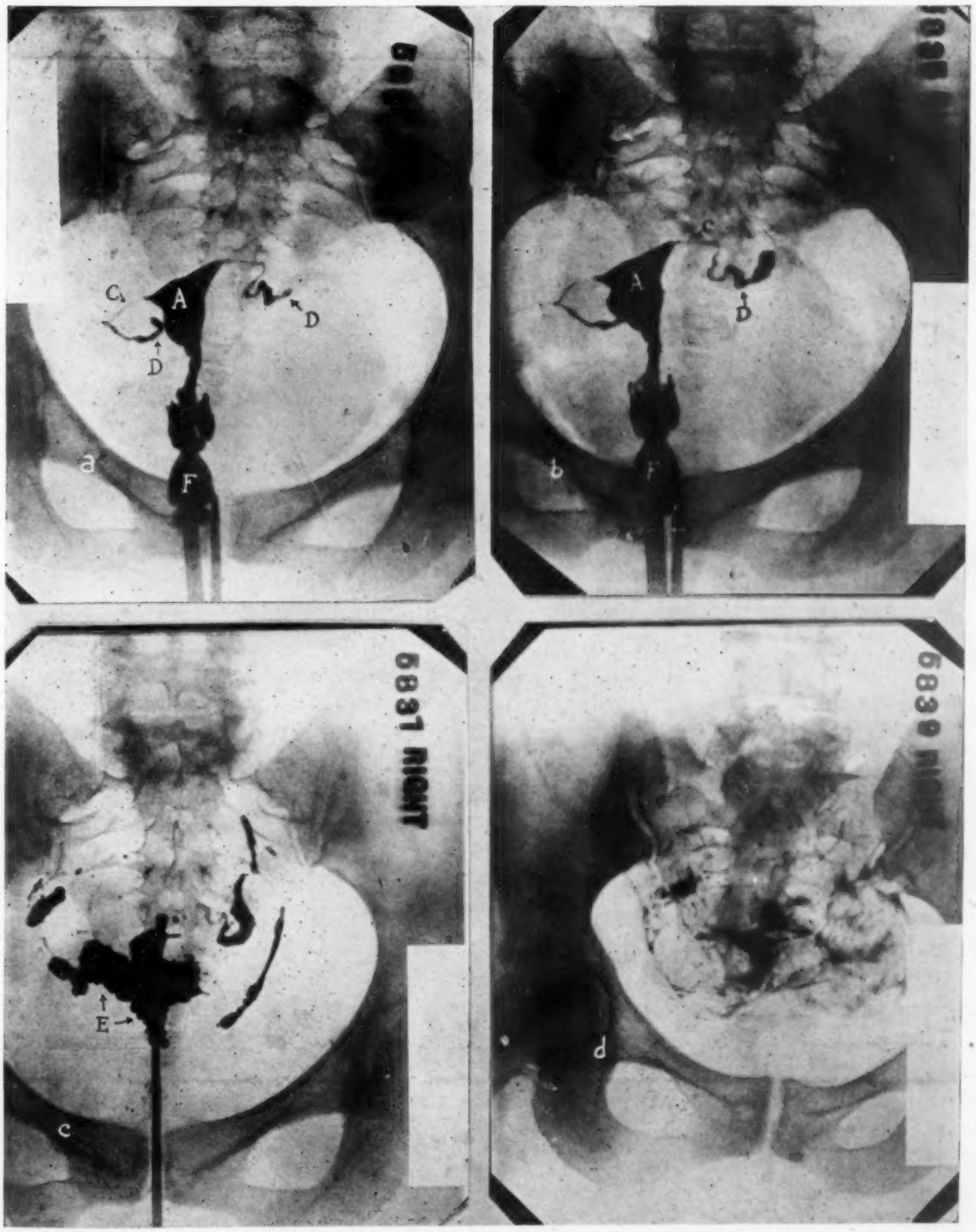

FIG. 17. Left Fallopian tube adherent posteriorly to uterus. (For explanation of capital letters compare with Fig. 2.)

a, b. Adherent tube.

c. Oil drained off and a sound introduced to orient position of uterus. Note droplet formation of oil resulting from adhesions of left tube.

d. Free oil in peritoneal cavity.

Patient was thirty-eight years old and complained of primary sterility. She had been married twice, living twelve years with her first husband and five with her second. Her second husband had two children by a previous marriage. Result of prior insufflation indicated tubal occlusion. Pelvic examination was difficult because of obesity.

processes in the tubes. Schultze has found that, when the tubes are patent, the contrast medium appears in the peritoneal

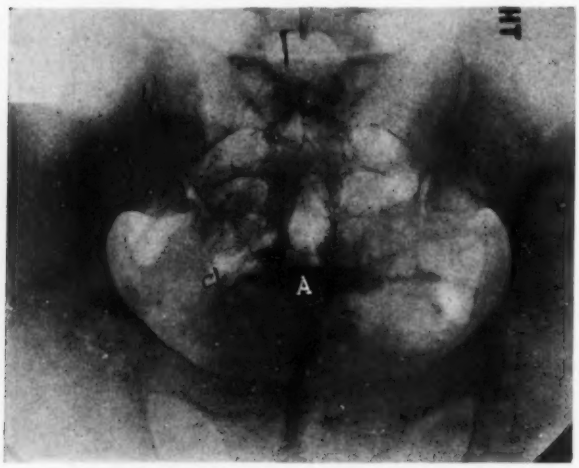

Fig. 18. Sharply anteflexed uterus. (For explanation of letters compare with Fig. 2.)

Note that vertical diameter of uterine shadow is foreshortened. There is absence of a shadow for left Fallopian tube beyond middle of isthmus, due to occlusion. Right tubal shadow is absent beyond cornua of uterus.

Patient was twenty-six years old and complained of primary sterility. She had been married five years. Shortly after her marriage her vermiform appendix and right Fallopian tube had been removed. There was a small fibroma on left side of uterus.

cavity first in the form of drops, which later coalesce to form a larger shadow. He believes that inflammatory thickening of the walls of the tubes causing diminished peristalsis may interfere with filling of the tubes even when there is no actual obstruction. The chief source of error in uterosalpingography, Schultze asserts, is insufficient filling of the uterus and tubes by the contrast material. Sufficient iodized oil must be introduced into the uterus to induce contractions, so that the contrast medium will be propelled into the tubes.

In 50 cases in which the course of the Fallopian tubes was studied by uterosalpingography, Rubin[18] found that the tube emerged from the uterine cavity in a straight course in almost every case in which the tube shadow was clearly shown. In 17 cases in which both tube shadows were visible, the intramuscular portion was clearly patent and in all but one a straight course was observed.

Schneider and Eisler,[36] in a study of the condition of the tubes by uterosalpingography, found not only definite peristalsis but evidence of a true sphincter at or near the uterine end of the tube. By the action of this sphincter the continuity of the shadow between the uterus and the tube was broken or reduced to a mere thread, or occasionally constricted as by an annular band.

Reinberg and Arnstam[37] also found evidence of such a sphincter in the uterine end of the tube. At this point there was an annular contraction of the shadow, which sometimes entirely interrupted the continuity of the shadow between the uterus and the tube, but more frequently merely narrowed and constricted it.

From examination of specimens from normal Fallopian tubes, Hermstein[38] was unable to demonstrate the presence of any true sphincter at or near the uterine end of the tube, such as some investigators have claimed is shown in uterosalpingography. In only 2 specimens out of a large series did he find evidence of a muscular spasm obstructing the lumen of the tube without any evidence of inflammatory changes.

In a study of conditions in the Fallopian tubes after intrauterine injection of iodized oil, Popović[8] found that, when the tubes are normally patent, the oil passes through the tubes in a progressive stream and small drops eventually appear in the abdominal cavity. When the tube is dilated and some secretion is present, the contrast medium does not move in this stream-like form but appears as large, round drops, which may be arranged as if strung on a thread, or may spread out and pass all at once to a definite part of the tube where they become more or less confluent. A deposit of oil may occur in the tube without preliminary formation of these large drops. This finding, also, is evidence of dilatation of the tube.

In a study of the uterus and tubes on the fluoroscopic screen and by serial radiograms during and after the injection of an opaque

substance, Gosset, Ledoux-Lebard and Béclère[39] demonstrated definite uterine contractions, the amplitude and rhythm of which varied in different individuals. Three zones of contractions could be definitely distinguished; i.e., the two cornua and the region of the isthmus. The contractions of the cornua were more frequent and clearly defined. The contractions of the cornua originated at the extremity nearest

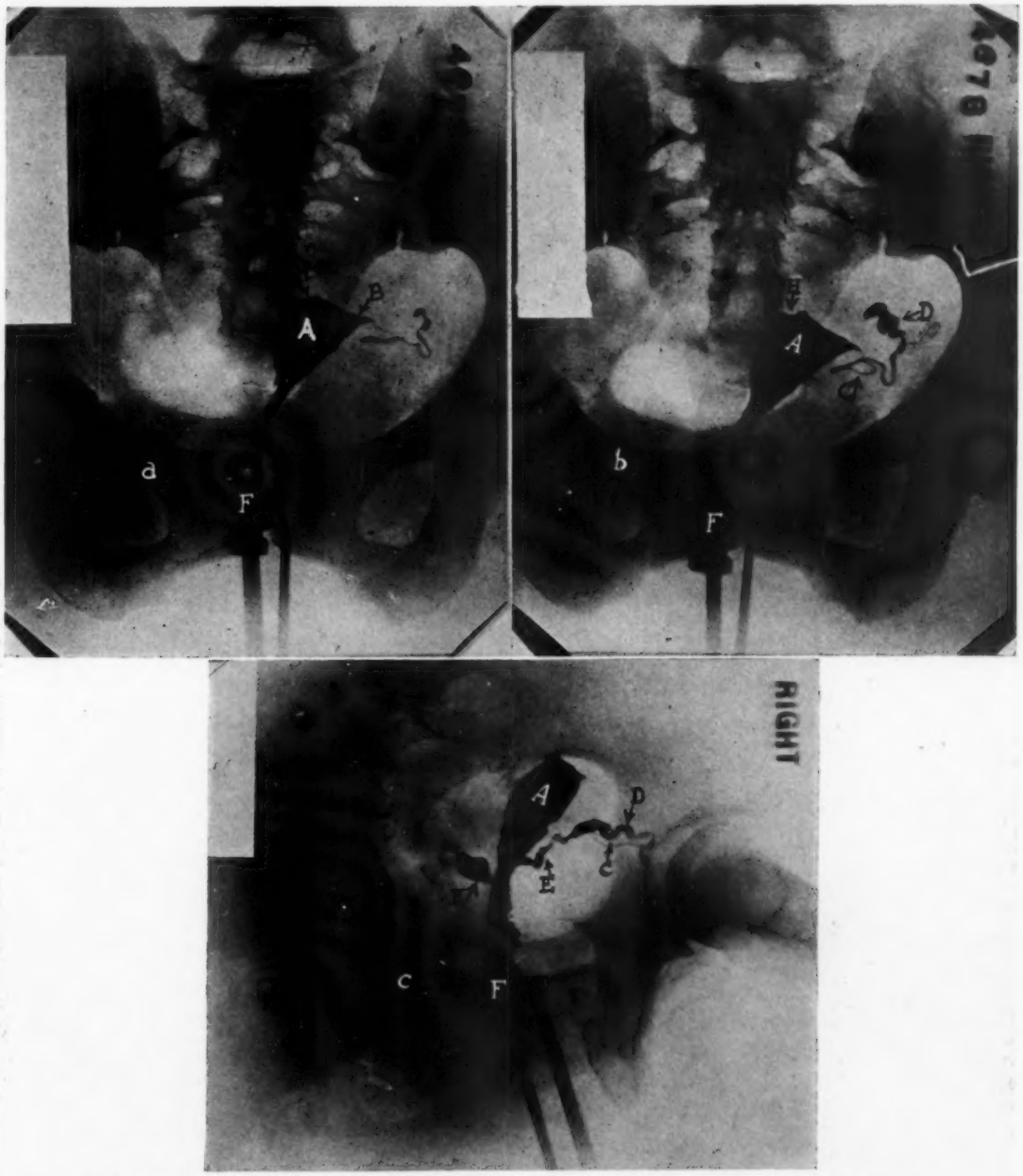

Fig. 19. Dextroverted uterus. (For explanation of capital letters compare with Fig. 2.)

There is a small fibroma at left cornu producing indentation of uterine shadow and occlusion of left Fallopian tube at isthmus.

Patient was twenty-five years old and complained of primary sterility. She had been married three and a half years. Introitus was small and cervix was conical with a pinhole os. Uterus was small, anteflexed and dextroverted. Adnexa could not be palpated. Under transuterine insufflation a pressure of 160 mm. was reached without a drop in mercury. Also, auscultation was negative, there was no shoulder pain, and roentgenologic examination did not show free air in peritoneal cavity. Several attempts to force gas through tubes were made, but all were unsuccessful.

the tube and moved toward the center of the uterine cavity. From their study of the so-called sphincter described by Reinberg and Arnstam,[37] they concluded that this sphincter lies in the uterus itself, a few millimeters from the origin of the tube, rather than in the tube. In using uterosalpingography for diagnostic purposes, it is believed, the injection of the opaque substance should always be controlled by the fluoroscope in order to study the uterine contractions and avoid certain erroneous

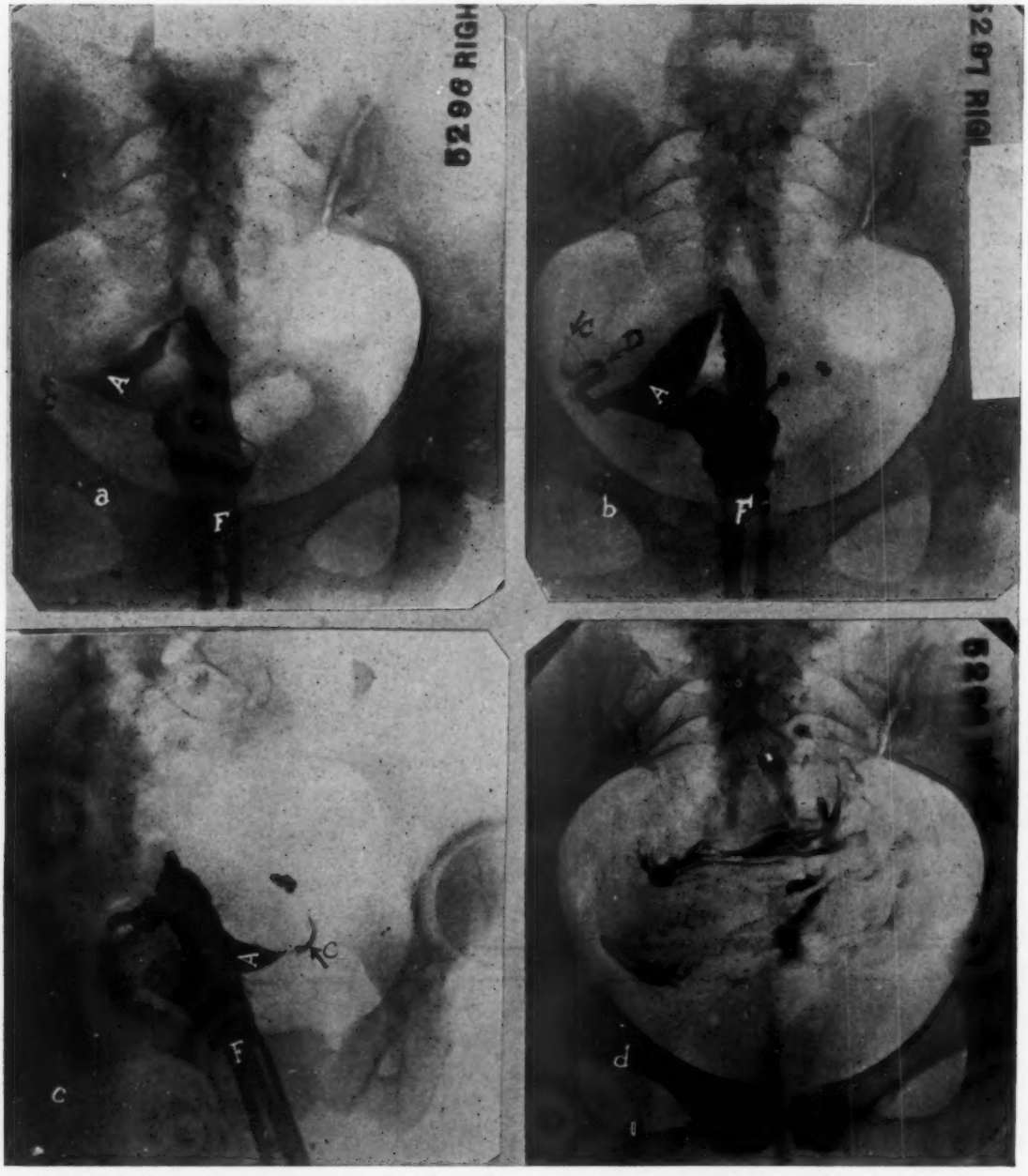

Fig. 20. Marked displacement of uterus to left and posteriorly. (For explanation of capital letters compare with Fig. 2.)

Patient was twenty-four years old and complained of inability to conceive. She had been married seven months. Ten years prior to examination, a right-sided ovarian cyst had been removed. Uterus was of moderate size but markedly displaced posteriorly and rotated to left. Insufflation with air reached a pressure of 200 mm. without a drop and all other signs of tubal patency were absent.

conclusions in regard to filling defects which these contractions may temporarily simulate.

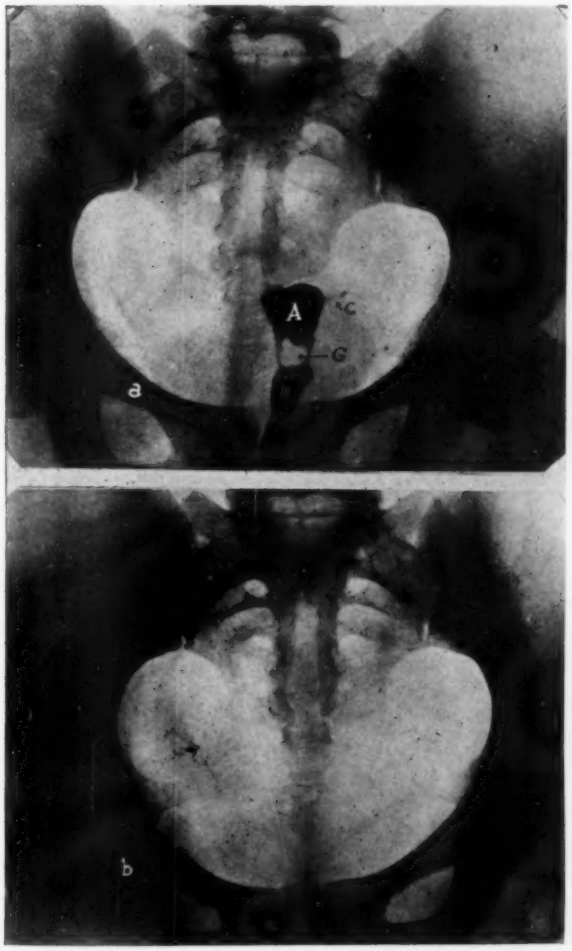

Fig. 21. Congenital procidentia, retroflexion, subinvolution and placental polyp.

a. A, shadow of uterine cavity. C, isthmus of Fallopian tube. G, defect in shadow of uterine cavity produced by placental polyp.

b. Small quantity of oil in left Fallopian tube; none in peritoneal cavity. A pressure of only 30 mm. was used in order to avoid introduction of oil into peritoneal cavity.

Patient was thirty years old and complained of backache, prolapse and occasional bleeding. She had had one child three and one-half years prior to examination and two abortions since that time, last (three months' pregnancy) two and a half months before. Cervix was long, protruding a distance of 5 cm. from vagina, and oozed blood. Uterus was size of a seven weeks' pregnancy, boggy, very tender and retroflexed.

Patient was put in knee-chest position, uterus replaced anteriorly, and ergot and pituitary extract administered for several days. It remained in place, contracted and became firm. Also, cervix no longer protruded from vagina when erect position was assumed. Bleeding occurred intermittently.

Randall[40] reported that uterosalpingography has been employed in the Mayo Clinic chiefly for the study of conditions in the Fallopian tubes.

TECHNICAL CONSIDERATIONS

The technique of employing uterosalpingography has been described in my first paper and will not be repeated here. However, there are certain items not previously mentioned to which I should like to call attention at this juncture.

Hitherto one of the drawbacks to uterosalpingography was the uncertainty of the operator at a given time with regard to the amount of iodized oil injected and its pressure.

In order that the operator may know the exact amount and pressure of the oil injected, I have devised the nozzle and syringe with manometer attachment shown in Figure 1. This apparatus, I believe, is especially useful for uterosalpingoscopy and for uterosalpingography in cases of chronic salpingitis, when it may be desirable to leave the oil in the Fallopian tubes for therapeutic purposes; also in other conditions in which it may be undesirable to force uterine contents into the peritoneal cavity.

Care should be taken that the iodized oil is perfectly fresh. A reddish discoloration indicates that it has become decomposed with the liberation of iodine. Such iodized oil should not be used.

No anesthetic is required and the patient feels none the worse for the procedure. Still the physician should insist upon absolute rest afterward. Occasionally one encounters a patient who feels faint or complains of nausea merely after the introduction of the uterine sound or the nozzle. In such cases, it is better to delay the injection for a few minutes, meantime leaving the sound or nozzle in place. If the symptoms do not abate after 0.5 c.c. of the oil

Pathological examination of tissue causing filling defect in uterine cavity (removed by curettage) showed it to be a placental polyp.

has been injected, it is better to discontinue the procedure until some other time.

Some patients are extremely sensitive to intrauterine manipulation. I recall the case of a woman who on two different occasions became faint and pale after the injection of the first cubic centimeter. When she was reassured, she allowed 3 c.c. more to be injected. Then, however, she complained of discomfort. When the instruments were withdrawn, she was relieved immediately. This case was observed before I had my instrument with manometer attachment. I do not know, therefore, what the pressure was. Knowing the pressure at all times with the manometer instrument, we need not fear the production of shock by excessive pressure.

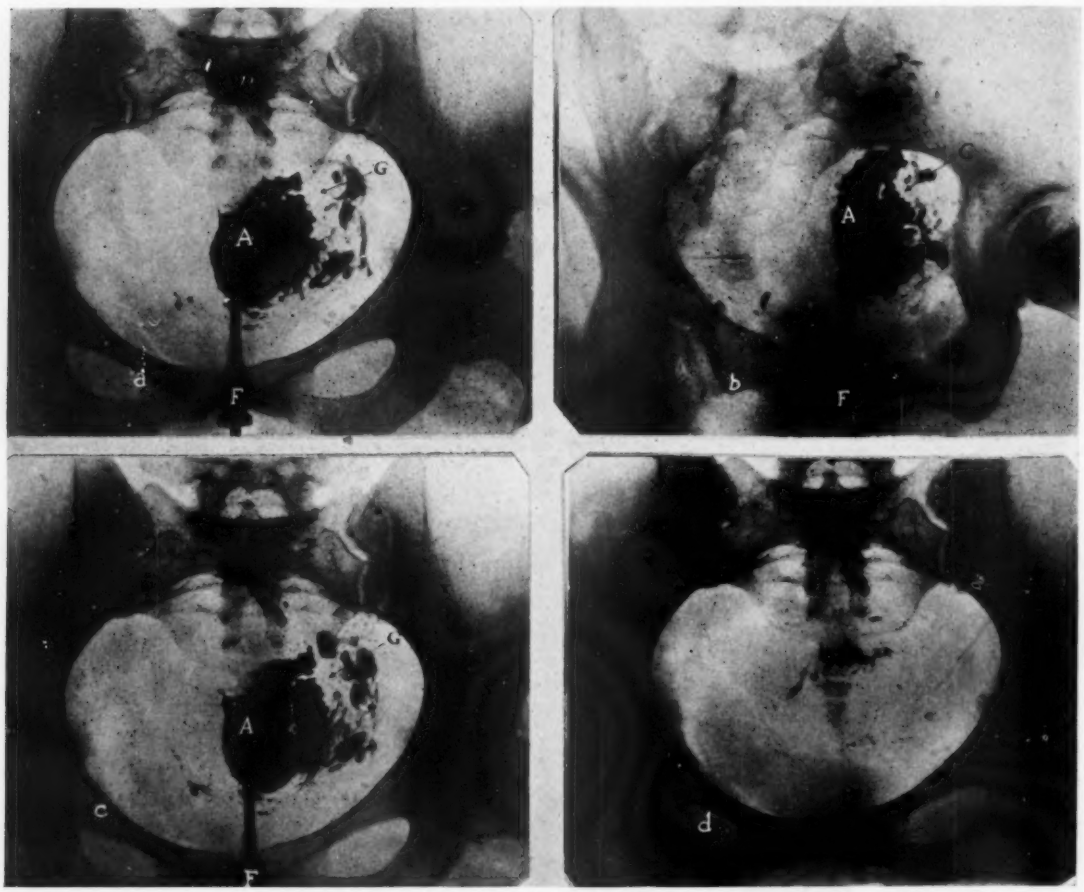

Fig. 22. Gravid uterus. (For explanation of capital letters compare with Fig. 2.) G, filling defect produced by presence of ovum.

a, b, c. Iodized oil has distributed itself between decidua capsularis and decidua vera. Mottled shadow near G is due to escape of oil between villi of decidua basalis.

d. Some of oil left in uterine cavity; none in peritoneal cavity.

Patient was thirty-two years old and complained of intermittent bleeding. She had been married thirteen years and had three children, last two and one-half years prior to examination. She had had four abortions, last three and one-half years before. At twenty-five she had had an appendectomy and puncture of an ovarian cyst. Uterus was size of a two and one-half months' pregnancy and somewhat irregular. Cervix had been amputated. Diagnosis was of pregnancy with uterine fibrosis.

An injection of 12 c.c. of iodized oil under a pressure of 30 mm. was given. Twenty-four hours after injection temperature rose to 103.6°F., uterine contractions began, and several fleshy clots were expelled. On following day temperature dropped to normal but profuse bleeding continued. Curettage was performed and recovery was uneventful. Scrapings were found to contain decidua and villi.

The following roentgen-ray technique was employed in my observations:

Apparatus: Monex machine; J. Bentley Squier G. U. table; Bucky diaphragm; Miller Metallix X-ray tube.

Distance: 28 inches.

Voltage: 140 to 200 primary volts, according to patient's size.

Milliamperage: 20 milliamperes.

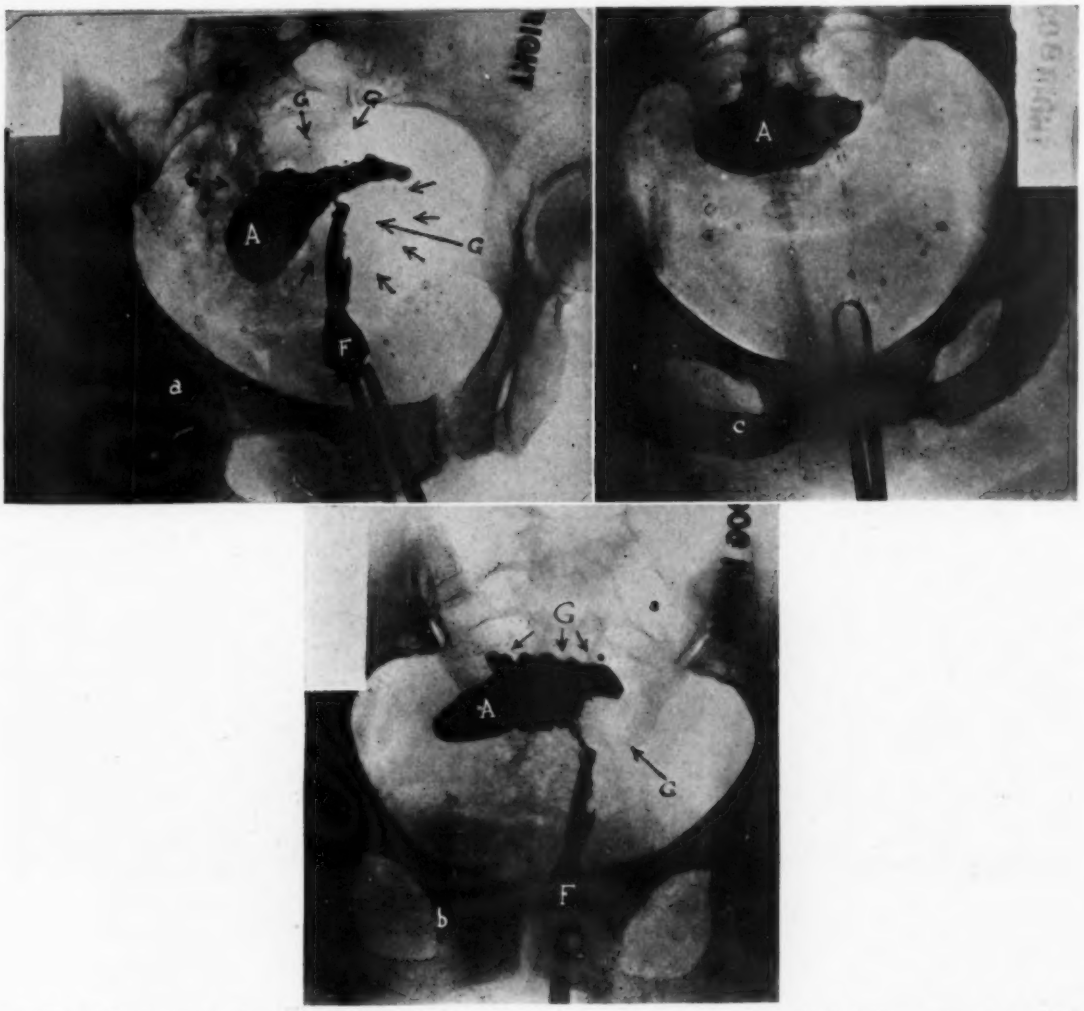

Fig. 23. Gravid uterus and multiple fibromyomata. (For explanation of capital letters compare with Fig. 2.) G, filling defect due to fibromyomata (upper) and ovum (lower).

c. Oil retained in uterus after withdrawal of nozzle.

Patient was forty years old, pregnant, and complained of cyanosis and dyspnea. She had been married nineteen years and had three children, last twelve years before. At thirty-one a therapeutic abortion had been induced because of cardiac decompensation. Cardiac condition was mitral stenosis.

Uterus was size of a two and one-half months' pregnancy and irregular in outline. Injections of iodized oil caused no ill effects. Therapeutic abortion was performed.

Exposure: 4 to 7 seconds.

Position. Stereoscopic films made in dorsal recumbent, right lateral prone and left lateral prone positions. Film in dorsal recumbent position after uterine cavity has been drained of oil, and again after twenty-four hours.

In a series of uterosalpingograms, one may find that one or both tubes may be shown only partially or not at all in one picture, whereas they may appear in their entirety in another. This apparent discrepancy is due to superimposition of shadows; the shadow of the Fallopian tube is eclipsed by that of the uterine cavity. Another source of confusion is rapid emptying of the tube either into the uterus or the abdominal cavity. For these reasons, one must base his deductions not upon a single film but upon a series.

DISCUSSION

With regard to priority for the use of

iodized oil in gynecology, I think the credit belongs to Sidney Forsdike,[41] of London. His paper, which was the first to be published on this subject, was read before the Royal Society of Medicine in London on March 5, 1925. It was printed in the *Proceedings* of that society under that date and also in the *Journal of Obstetrics and Gynaecology of the British Empire* for June, 1925. Forsdike worked with lipiodol on animals and humans for two years before reporting his experiences.

Some patients with uterine fibromyomata insist upon knowing whether their reproductive functions will be maintained if operation is performed and demand irradiation treatment instead if a negative reply is given. I recall the case of a young widow, who consulted me with her fiancé and said that she would break her engagement unless assured that it would be possible for her to conceive. Other women wish to be informed whether their tubes and ovaries were removed at previous

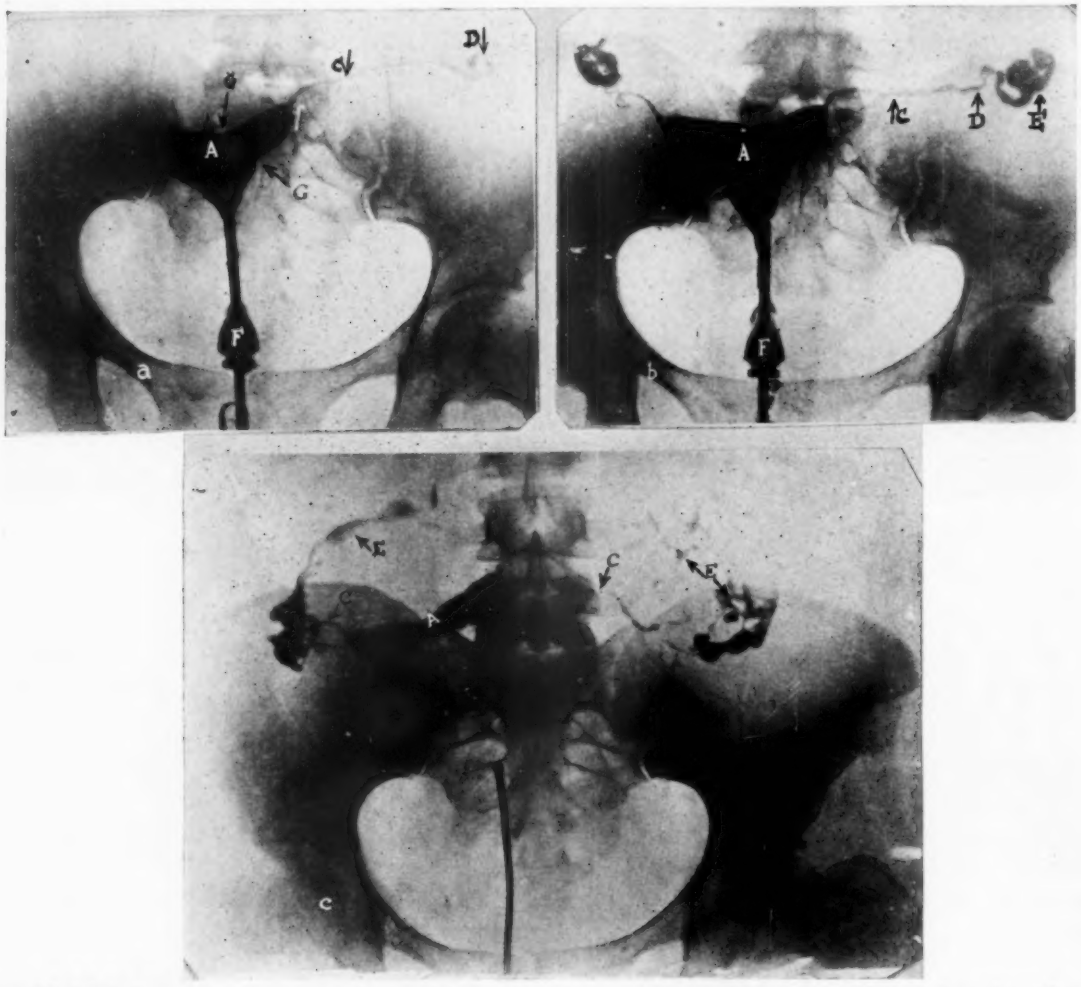

Fig. 24. Multiple large fibromyomata; patent Fallopian tubes; atonic uterine cavity. (For explanation of capital letters compare with Fig. 2.)

a. Indentation G is produced by multiple fibromyomata.

Patient was thirty-eight years old and complained of a backache and a heavy feeling in lower abdomen. She had been married twenty years and had three children and one abortion. Menstruation occurred every three weeks and was followed for many days by staining. Uterus was found to be much larger than at an examination eleven years previously. There were a large number of fibromyomata, some of which were pedunculated. A hemic murmur was heard at the base of heart.

operations. In such cases uterosalpingoscopy may help materially with regard to prognosis.

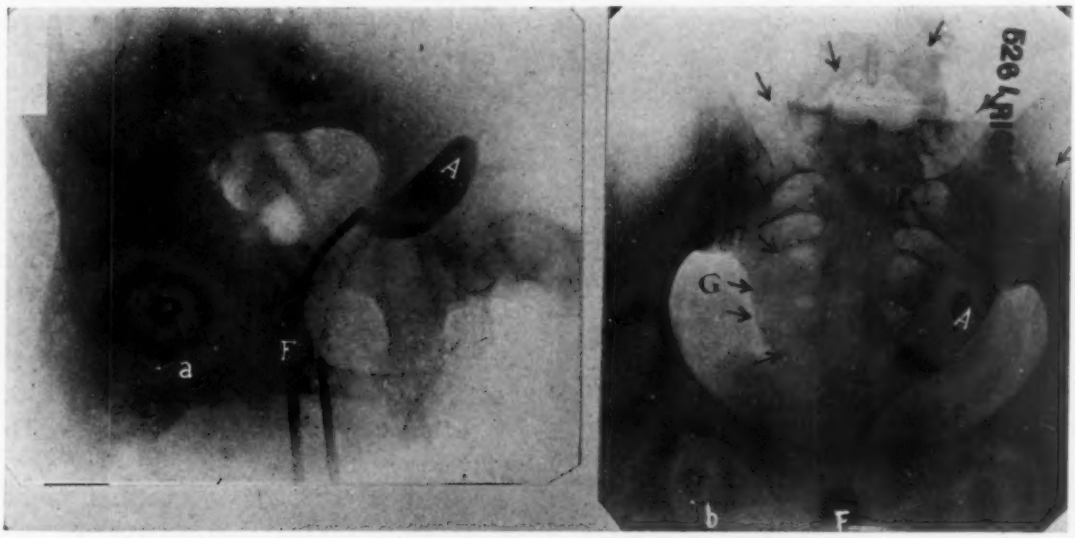

Fig. 25. Multiple large fibromyomata of uterus. (For explanation of capital letters compare with Fig. 2.)

Arrows (G) outline tumor, which is flattening and displacing uterus.

Patient was thirty years old, married twelve years, and had two children. Her illness dated back six months and was manifested by progressive increase in size of abdomen, severe backache and pressure symptoms. Uterus was size of a three and one-half months' pregnancy. Twenty-four hours after uterosalpingography, supravaginal hysterectomy was performed. No free oil or sign of peritoneal irritation was found. Recovery was uneventful.

In some cases the uterus accommodates a larger amount of oil and the uterogram is larger than one would expect from the findings on palpation. This condition is due to atony of the uterine musculature. When uterine tone is good, the organ empties itself of the oil within a few seconds of the time when the nozzle is withdrawn. In cases of uterine atony, emptying is materially delayed. Figure 15 shows retention of the oil for twenty-four hours, due to atony.

A characteristic finding in hydrosalpinx and conditions in which the Fallopian tube is held in adhesions is a droplet formation of the oil. This finding is well shown in Figures 11, 12, 13 and 17. Figure 6 shows how iodized oil, squirted from a syringe into a glassful of water, sinks to the bottom and arranges itself there in droplet formation.

With regard to the correction of sterility by uterosalpingography, I cannot as yet state the percentage incidence of subsequent pregnancies as compared with those after insufflation of gas. My belief, however, is that it will eventually prove to be greater, because the iodized oil not only holds the occluded tubes patent for a longer interval but may also facilitate absorption of old inflammatory lesions.

In some of my cases uterosalpingography gave evidence of therapeutic as well as diagnostic value. It helped to relieve tubal occlusion, dilate stenosed tubes and overcome states of tubal inflammation.

Although iodized oils would appear to have therapeutic value in the Fallopian tubes, we do not know to what factor this virtue should be attributed. I performed some experiments which indicate that we cannot ascribe it to any direct antiseptic power of the oil. In bacteriologic studies with lipiodol and iodipin, I found that dilutions of 1:200, 1:100 and 1:50 had no direct antiseptic effect upon cultures of staphylococcus or Bacillus coli. Additions of iodized oil to the culture media in these dilutions failed to inhibit the growth of the microörganisms after twenty-four and forty-eight hours.

The slow liberation of iodine may be a factor for therapeutic good, or possibly the mere presence of the innocuous oil serves to

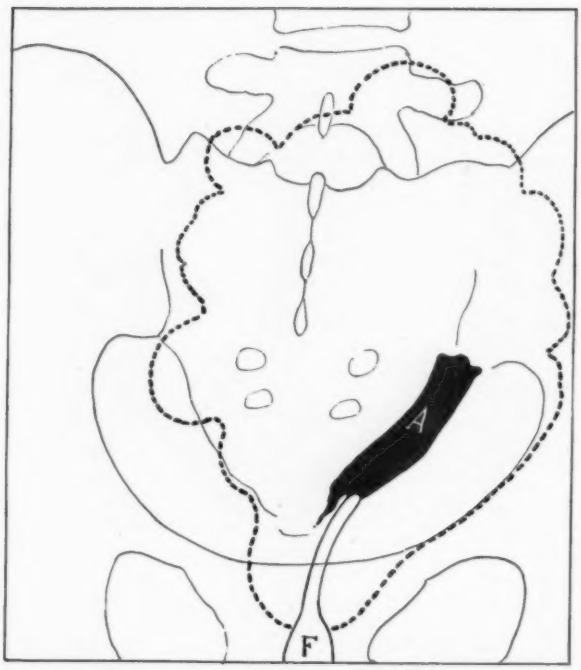

Fig. 26. Diagram from same case as Figure 25. (For explanation of letters compare with Fig. 2.)
Dotted line shows outline of fibroid uterus.

stimulate the resisting mechanisms. Further study is needed with reference to the therapeutic application of uterosalpingography and its explanation.

Sometimes the iodized oil accumulates around the ampulla, making it impossible to determine whether it lies in the dilated ampulla of the tube or is held there by old adhesions in a pocket of peritoneum. The differentiation can be made only after repeated roentgenograms are taken over a period of twenty-four hours or perhaps several days.

One must not be too hasty to conclude that the tube is occluded because the oil does not enter the peritoneal cavity readily. Sometimes there is a club-shaped shadow in the course of the tube with no free oil in the peritoneal cavity; but, when a little more oil is injected and more roentgenograms are taken, a continuation of the tube and the entrance of free oil into the peritoneal cavity can be observed.

It is interesting to note that the salpingogram may show a distinct pathological process, notwithstanding the fact that the Fallopian tubes appear perfectly normal on palpation. For example, there may be interrupted filling defects in the tube, giving it a knobby appearance. This appearance is often due to perisalpingitis.

If careful attention is paid to complaints of discomfort, rupture of the tube should never occur unless undue force is employed. The use of the instrument with manometer attachment makes this accident extremely unlikely. If the patient complains of discomfort, the injection should be stopped until the pain abates. It may be due only to uterine or tubal stretching, or to contraction of the uterus.

While there is a theoretical possibility of carrying infected contents of the tubes into the peritoneal cavity by uterosalpingography, I believe that this danger is less than when insufflation of gas is employed. The gas is more likely to carry undiluted infectious material over a larger area in the peritoneal cavity, possibly reaching as high as the subdiaphragmatic space. The oil, on the contrary, mixes with and dilutes such infectious material as may be present. Rapid absorption of large quantities of infectious material is therefore much less likely.

CONCLUSIONS

1. Recent investigations have corroborated the diagnostic value of uterosalpingography and greatly increased the scope of this procedure.

2. Properly employed with an aseptic technique and in selected cases, the injection of iodized oil for roentgenological visualization of the uterus and Fallopian tubes is entirely harmless.

3. The contraindications to uterosalpingography include pregnancy, unless therapeutic abortion is contemplated; gonorrhea and acute tubal inflammation; malignant growths of the uterus, because of the danger of carrying the cancer cells into the peritoneal cavity; and menstruation and profuse uterine bleeding.

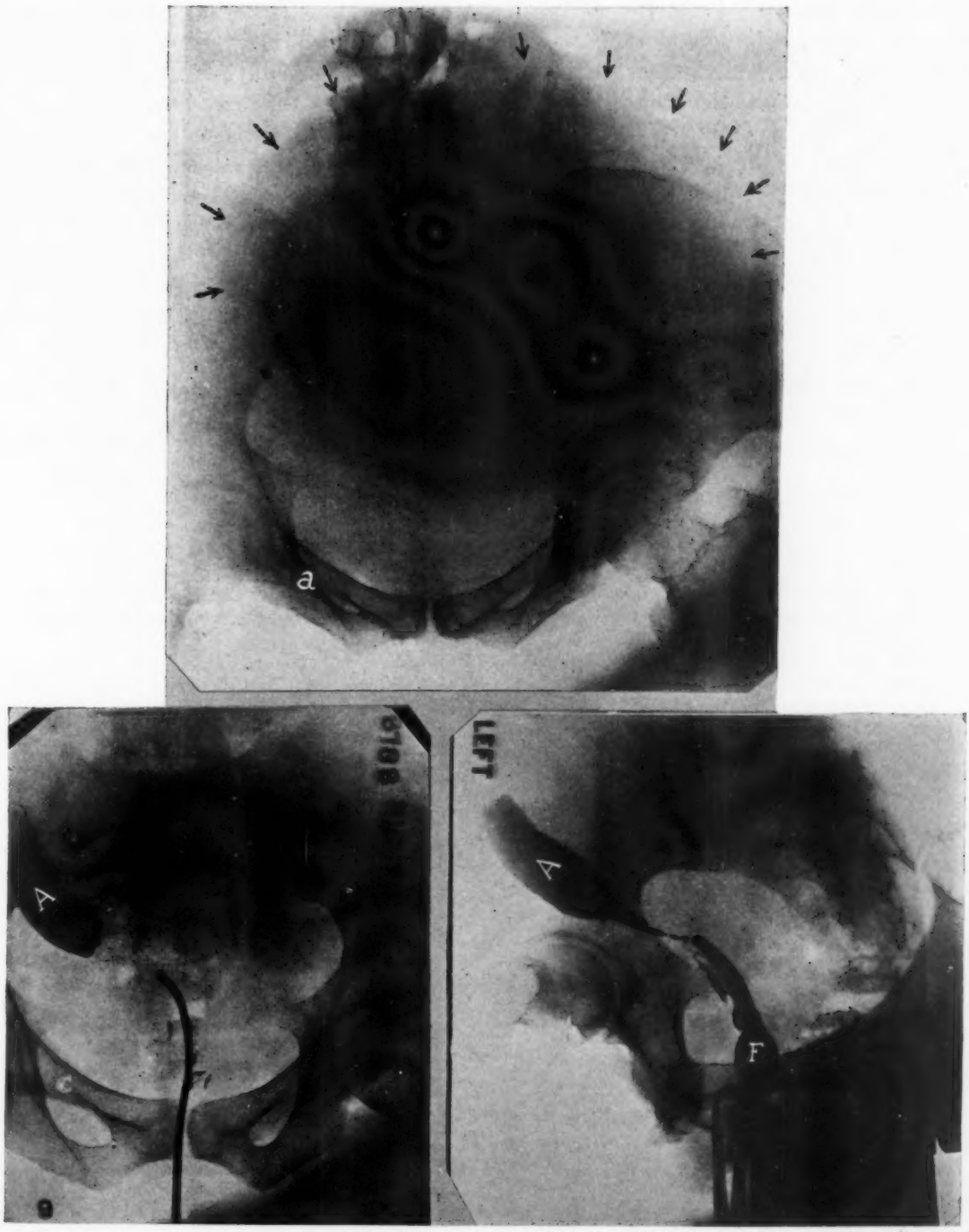

FIG. 27. Enormous uterine fibromyoma differentiated from ovarian cyst by uterosalpingography. (For explanation of capital letters compare with Fig. 2.)

a. Arrows outline tumor. This was an ordinary roentgenogram, which suggested that growth was an ovarian cyst.

b. After injection of iodized oil, filling defect in uterine cavity suggested fibromyoma as nature of growth.

c. After withdrawal of nozzle, some of oil was retained in uterine cavity.

Patient was thirty-five years old, married nine years, and had two children. A pelvic growth was observed during her first pregnancy. There was rapid growth in size of tumor during last six months. Abdominal and pelvic examination revealed a smooth cystic growth filling pelvis and extending above umbilicus. Uterus could not be mapped out.

Laparotomy twenty-four hours after uterosalpingography disclosed an enormous uterine fibromyoma. Supravaginal hysterectomy and left salpingo-oöphorectomy were performed. No fresh adhesions or signs of peritoneal irritation were found. Recovery was uneventful.

4. The injection of iodized oil is of therapeutic value in cases of chronic salpingitis and may sometimes avoid the necessity of operations on the Fallopian tubes for sterility.

5. Even when the diagnosis of a gynecologic condition can be made without the aid of uterosalpingography, this procedure adds a decided element of exactness as to the localization and extent of the lesion.

6. A new syringe with manometer attachment is described, by which the operator can know at any time the amount of oil injected and its pressure.

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LIPIODOL AS A DIAGNOSTIC AID

IN FIBROMATA OF THE FEMALE GENITAL TRACT*

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THE value of lipiodol as a diagnostic aid in gynecology has been well substantiated. In competent hands, this method of visualizing cavities of the genital tract has been proved to be an artful aid, sufficiently free from harm to be of real practical value. Its *raison d'etre* is as rational as that of the visualization of the urinary tract; the frequency of genital abnormalities in the female gives it much academic as well as practical value. Notwithstanding these facts, this aid to gynecological diagnosis has not been sufficiently used to establish mass information or reliable acumen in reading the roentgenograms; hence, any new material should be welcome. The willingness of the female patient to submit to operation and the interest of the surgeon in operation should not stand in the way of our best efforts toward exactness in preoperative gynecologic diagnosis. The following cases are illustrative:

A single woman, aged twenty-two, presented the classic picture of ectopic pregnancy; exposure, missed period with uterine bleeding three weeks later, and a doughy, rather fixed, mass in the region of the right tube. By means of lipiodol, the cavities of both tubes were visualized and shown to be normal. Because of the fact that at a previous operation the right ovary had been removed, the diagnosis of intraligamentary cyst was made and the indication for operation was changed from an emergency to that of one of election. Later, the diagnosis of intraligamentary cyst was proved at operation.

In another case, that of a young girl of fifteen, who had had an amenorrhea of five months and a mass in the lower abdomen, just the shape and size of a five months' pregnancy, lipiodol proved extremely useful. This patient's mother had been told by the interne that her daughter was pregnant. I saw this patient the following day and on bimanual examination made out a small mass in the right side of the pelvis, which seemed to have been pushed up near the symphysis by the larger mass. I felt that this might be the infantile uterus. The patient absolutely denied the possibility of pregnancy, no fetal heart could be heard and no fetus could be palpated. The cervix was small and showed no signs of pregnancy. The uterus was then very carefully sounded and found to be of less than normal depth. Lipiodol was then injected and the skiagram showed the uterus to be infantile, both tubes filling normally, and the uterus pushed considerably to the right side. The temperature record, the white blood cell count, and the sedimentation test pointed toward abscess, and this diagnosis was made and proved at operation.[1]

Two applications of this method of diagnosis seem to be missing from the literature; the one, of visualizing fibromata in the vagina, uterus and pelvis, and the other, of the prognostic value of this method in subacute and chronic salpingitis. Out of a mass of material collected from the injection of 150 patients under my supervision,[2] I submit 6 cases of fibromata of the female genital tract visualized by lipiodol and the roentgen ray. The question of the use of lipiodol as a prognostic aid in salpingitis will be discussed in a subsequent paper.

CASE REPORTS AND DISCUSSION OF ILLUSTRATIONS

CASE 1 (Fig. 1). This patient, aged nineteen, came to the hospital in October, 1927, with a condition in which differentiation between appendicitis and right salpingitis was difficult.

[1] This patient was from the service of and was operated upon by Dr. Raymond Watkins.

[2] Some of this material has been reported in *Northwest Med.*, 27: 222, 1928.

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This skiagram, taken after the injection of lipiodol, showed a normal uterine cavity (there is a defect on the right side, due no doubt, to the cannula) and normal tubes. A constriction in the tubouterine junction on each side was also seen. (This has been described by Rubin as caused by sphincteric action). The patient was operated on the same day, with a diagnosis of subacute appendicitis, disease of the right tube having been eliminated by the roentgen ray. The appendix was found considerably swollen and inflamed. She made an uneventful recovery, became pregnant in three months, and within a year after the injection of lipiodol I delivered her of a normal living baby, weighing 3395 gm. This case suggested that the use of lipiodol in the tubes does not jeopardize the chance of future pregnancy.

Fig. 1. Skiagram of Case I, shown, primarily, as one of normal uterine cavity and tubes to be used as contrast in the plates that follow.

Fig. 2. Case II. Skiagram showing tumor with pedicle.

Fig. 3A. Case III. Skiagram showing elongated uterine cavity and large crescent-shaped filling defect. Uterine fibroid.

Fig. 3B. Case III. Photograph of the specimen after a supravaginal hysterectomy, showing the uterine cavity and the large fibromyoma, cut into.

Here, then, is a case in which injection of lipiodol was an aid in the differential diagnosis between right salpingitis and acute appendicitis; in which a constriction, probably

sphincteric, is shown in both tubouterine junctions and in which a pregnancy and delivery of a normal baby ensued within the year.

Fig. 4a. Case iv. Skiagram showing elongated lower uterine segment and large concave filling defect. Multiple fibroids of uterus.

Fig. 5a. Case v. Skiagram.

Case ii (Fig. 2). This patient, aged forty-three, complained of metrorrhagia and loss of strength for two years and recently of a foul, blood-tinged leucorrhea. Examination revealed a round, hard mass filling the pelvis, as dose a baby's head. The fingers could not be passed around the tumor, and no attachment could be felt. Lipiodol was injected all around the tumor with a soft rubber catheter, and the skiagram (Fig. 2) visualized the tumor with its

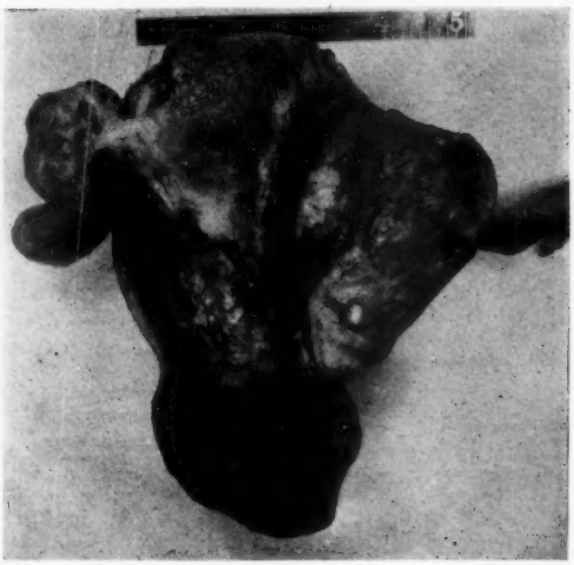

Fig. 4b. Case iv. Photograph of specimen removed.

pedicle, which I presumed was attached inside the uterus.

The tumor was delivered through the vulva, as a baby's head would be, with a pair of obstetrical forceps. When the pedicle was exposed, it was clamped and the tumor was amputated. The pedicle was closed with a continuous suture of chromic catgut. The uterus

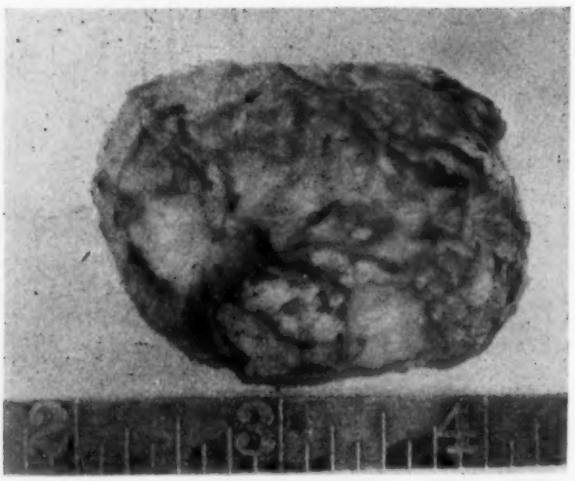

Fig. 5b. Case v. Pathological specimen. Fibromata of ovary.

was so inverted as to be almost saucer shaped. The cervical wall was about 3 cm. in thickness and the cervical opening was about 7 cm. in diameter. The eversion could not be reduced

by pressure and was apparently one of long standing. The patient made an uneventful recovery, and when seen six months after the operation, the uterus was gradually returning to normal shape, and the patient was free from bleeding and discharge. The pathological diagnosis was pedunculated submucous fibromyoma with hyaline degeneration and secondary chronic inflammation.

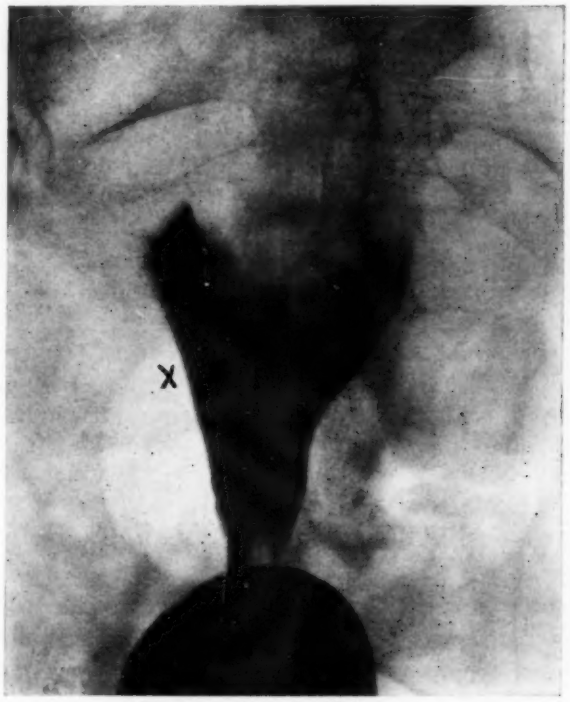

Fig. 6a. Case vi. Skiagram.

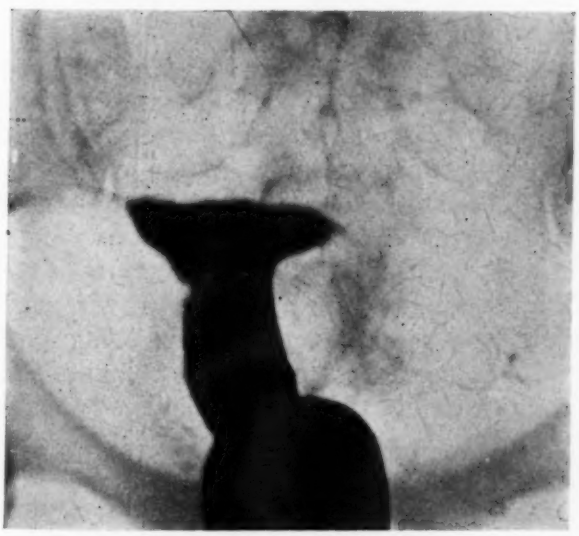

Fig. 7a. Case vii. Skiagram.

Case iii (Figs. 3a and b). This patient, aged forty-eight, complained of uterine bleeding, a feeling of weight in the pelvis, and bearing-down sensations. The pelvic examination was negative, except for the fact that the corpus of the uterus was approximately three times the normal size, and extremely hard. The skiagram (Fig. 3a) after oil injection showed considerable elongation of the uterine cavity with a large crescent-like filling defect. Diagnosis by skiagram: uterine fibroid.

Fig. 6b. Photograph of specimen after supravaginal hysterectomy and removal of right adnexa showing pedunculated fibroid and ovarian cyst.

Case iv (Figs. 4a and b). The patient, aged fifty, complained of a tumor in the abdomen which was slow growing and gave her considerable distress because of weight. The top of the growth could be palpated at the level of the umbilicus, and because of thick abdominal fat, the exact nature of the growth could not be ascertained nor could the corpus of the uterus be exactly located. A mass about the size of a normal uterine corpus could be felt just above the cervix to the right. The skiagram (Fig. 4a), following the injection of lipiodol, shows an enormous elongation of the lower uterine segment, and a large concave fill-

Plate 7b. Photograph of specimen removed, showing the cyst of left ovary and pedunculated fibroid. (Note how pedunculated fibroid causes widening of lower uterine segment in skiagram, Figure 7a.)

ing defect on the left side of the uterine cavity. Diagnosis: multiple fibroids of the uterus.

A photograph of the specimen (Fig. 4B) after supravaginal hysterectomy, shows that the mass near the cervix which I thought might be the fundus was one of the multiple fibromyomata of the uterine corpus. The crescent-like filling defect is explained by the large fibromyomata shown in the opened specimen.

Case v (Figs. 5A and B). In this case[3] as illustrated the lipiodol appears to have been injected with more than the usual force, and is scattered rather widely in the pelvis. The tumor is clearly outlined. The oil, being warm and thin, readily accommodates itself to the outer surface of a growth on which it falls. The uterus is seen sharply antiflexed. The fimbriated end of the tube apparently lies near the top of the tumor. Diagnosis: fibromata of the ovary.

Case vi (Figs. 6A and B). This woman, aged thirty-five, complained of almost constant blood-tinged spotting with no other ill-health. Bimanual examination was negative except that the uterine corpus was larger than normal, and there was felt a mass in the right adnexa which felt like an ovarian cyst the size of a hen's egg. After injection of lipiodol, the skiagram (Fig. 6A) revealed (1) a widening of the lower segment of the uterine cavity, (2) a concave filling defect in the fundus of the uterine cavity, and (3) at the point marked "x" (the original film showed this plainly) another filling defect with the concavity upwards, of the sort one would expect to find at the lower pole of a pedunculated fibroid. A diagnosis of pedunculated fibroid was made.

Case vii (Figs. 7A and B). This patient, colored, aged twenty-six, complained of almost continuous uterine hemorrhage for twenty days, following seven weeks of amennorrhea. During the last two weeks of this time she had nausea and vomiting and cramp-like pains in the left lower quadrant. Examination: There was free blood in the vagina and the cervix was slightly softened. The corpus of the uterus was anterior and slightly enlarged. There was a mass palpable in the left adnexa approximately 6 cm. in diameter and fluctuating. The history pointed definitely to ectopic pregnancy but the mass felt like an ovarian cyst. After the injection of oil, the skiagram (Fig. 7A) showed (1) marked evidence of disease of both tubes with almost complete obliteration of the right tube, (2) a marked widening of the lower segment of the uterine cavity (cf. Fig. 1), (3) a filling defect near the fundus of the uterus on the right side. This was the first of its kind that I had seen, and I was unable to account for the widening of the lower segment and the filling defect. At operation there was found bilateral subacute salpingitis, a cyst of the left ovary and multiple fibroids of the corpus of the uterus.

Both tubes, the cyst of the left ovary, and the corpus of the uterus were removed. This patient had a temperature of 100°F. for several days but left the hospital on the twentieth day in excellent condition.

Pathological diagnosis: sub-acute purulent salpingitis; simple cyst of the ovary; pedunculated submucous fibromyoma with secondary chronic inflammation and multiple intramural fibromyomata.

[3] This patient was from the service of, and was operated on, by Dr. Raymond Watkins.

SUMMARY

The presence of fibroids in the uterus is nearly always indicated by a deformity of the uterine canal.

The presence of intrauterine pedunculated fibroids can be ascertained by the shadow of the tumor itself and by the distortion of the uterine canal and the filling defects.

Intravaginal tumors may be outlined by the iodized oil and intra-abdominal tumors may occasionally be visualized in the same way.

In cases of large submucous myomata the uterine cavity often takes the shape of a crescent and in multiple tumors of the uterus the cavity is visualized in irregular form and sometimes enormously enlarged.

Since myomectomy is the procedure of choice in all but the exceptional case where the woman is under forty, it will seem important to be able to foresee, at least in a certain measure, the possibility of a conservative operation. Radiologic exploration of the uterus after the injection of iodized oil, in case of myomata, gives one a clear view of the relationship between the myomata and the cavity of the uterus and also establishes the fact as to the permeability of the tubes. This last fact is of importance since one would not want to conserve the uterine corpus unless the tubes were permeable.

FIFTH AVENUE HOSPITAL CLINICS

ROUTINE TREATMENT FOR PREOPERATIVE AND POSTOPERATIVE SURGICAL CASES*

THE mere suggestion of routine orders or standard treatments usually produces a shower of protests and only too often with justification. But in the average general hospital, where the Intern Staff is changing frequently, it is almost essential to have some basis for work.

With this in mind, the following regulations have been made for the use of the Staff to cover the preliminary treatment of certain types of cases admitted to the ward. However, it is emphasized that these rules are not inflexible and that individual cases should have individual orders. Also that these regulations are subject to revision at frequent intervals.

On discharge from the hospital, we have found it necessary to give each patient written instructions in regard to his diet, exercise and special treatments, as too often verbal advice is misunderstood or forgotten. Our follow-up results have been found much more satisfactory when patients have received written instructions and many of the worries and often the failures of convalescence have been overcome in this way.

It is our hope that in presenting these routine admission instructions and the regime and diets for convalescents, we will obtain suggestions and criticisms from other clinics and aid in establishing a standard which can be adopted by other Surgical Services.

PREFACE[1]

In a complex organization like that of a hospital, it is not always easy for the different members of the working force to get a clear idea of their duties. This particularly is the case in respect of those tasks that present themselves at irregular or long intervals of time. Customs spring into existence without the knowledge of those in authority and assume the authority of law in the absence of a definite statement that is easily accessible.

To help the House Officers in an understanding of their functions, this compilation of rules has been made. From time to time some shifting of old tasks and apportionment of new duties will be necessary. These assignments will be made by the Medical Board of the Hospital. The rules are numbered serially, certain numbers being omitted to allow for the introduction of new rules. Additions and revisions will be made by means of gummed slips which are to be pasted in their proper place. These rules are designed for male interns. Whenever there are female members of the House Staff, the head of the division concerned will make such readjustments in the rulings as may seem desirable.

The reputation of the hospital depends largely upon the interns. It is they who have the first contact with patients and with patient's friends. Furthermore the circumstances at this first meeting are often very trying. Someone is really or supposedly very ill, his friends are much discouraged or are in panic. The House Officer should remember that this nervous tension, often coupled with a very defective knowledge of English, makes the patient and his family and friends seem most unreasonable. He should remember also that he is the representative of a dignified and altruistic organization and that he is under peculiar obligation to be humane and patient and kind to the exclusion of all appearance of being annoyed, no matter how aggravating the circumstances.

The standing of the hospital in the

[1]Reprinted through the courtesy of the New York Hospital.

* From the Fifth Avenue Hospital, New York. Submitted for publication April 18, 1929.

community is based largely upon the impression made at these first meetings and it is of the greatest importance that the name Fifth Avenue Hospital should connote courtesy to all, even to the discourteous, and most painstaking care of all who are ill.

ROUTINE TREATMENTS FOR SPECIAL TYPES OF CANCER

1. *Traumatic Cases.*
   a. Treatment for shock.
   b. Examination of extremities and bony parts for fractures.
   c. Examination of abdomen for ruptured viscus.
   d. Neurological examination, for paralysis.
   e. Roentgen-ray as soon as possible, if necessary.

2. *Routine in Fracture of Skull.*
   Treatment for Shock.
   a. Get roentgen-ray as soon as possible.
   b. Elevate head of bed.
   c. Ice cap to head of patient.
   d. Clean up bleeding from ears and turn patient onto that side so that drainage is assured. *Do not plug up external auditory canal.*
   e. Record pulse and B.P. q ½ h.
   f. Routine eye and neurologic consultation, but interns are to examine patients for symptoms referable to the systems themselves.
   g. Spinal tap on attending order.
   h. Do not forget there may be other injuries; examine carefully and record findings.

3. *Treatment of Extensive Burn Cases.*
   All extensive burn cases are to be sent directly to the wards and not treated in the clinic. Upon arrival on the ward they are to be treated for shock. (Apply heat and as soon as possible get them under an electric light tent.) Force fluids, carbohydrates. Daily colonic irrigation, clysis if necessary. Intern should remove all loose skin and blisters and clean skin around burned areas with benzine and alcohol. Wet dressings of 5 per cent tannic-acid solution should then be applied to burned areas and kept wet for twenty-four hours. If burns are on face, use tannic-acid ointment. Blood chloride examination made 2 days. Chart intake and output.

4. *Non-Operative Pelvic Infections and Peritonitis.*
   a. Exaggerated Fowler's position.
   b. Ice bags to pelvis.
   c. B.i.d. hot colonic irrigation.
   d. Hot soda bicarbonate douche daily between colonics.
   e. Force fluids, general diet.
   f. Daily non-lob.
   g. Narcotics liberally.
   h. Blood typing P.R.N.

5. *Drainage of Wounds.*
   Attention is called to the fact that when combines are used as an outside dressing on drained wounds, the underneath gauze must be inspected frequently and changed whenever it becomes soiled. Combines are not as absorbable as plain gauze, hence the underneath gauze may become saturated without the combine being stained.

6. *Dressings.*
   Except in the case of emergency, dressings on the floor are to be done by the Intern on duty before he goes to the operating room in the morning.

7. *Routine Postoperative Treatment.*
   The following data are furnished for your information to guide you as to when certain procedures are carried out. This naturally presupposes that there are no contraindications in any of these procedures and, should any develop, individual instructions will be given for each case.
   a. Michel clips are to be removed on the 5th postoperative day.
   b. Silk skin stitches are to be removed on the 5th postoperative day.

c. Upper abdominal non-absorbable sutures are to be removed on 10th postoperative day.
d. Lower abdominal non-absorbable sutures are to be removed on the 7th postoperative day.
e. Patients with the postoperative diagnosis of chronic appendicitis for which appendectomy has been performed through a McBurney incision are to be allowed out of bed on the 6th postoperative day.
f. If the appendectomy was performed through the right rectus, patient to be allowed out of bed on the 8th day postoperative.
g. Patients with the postoperative diagnosis of inguinal hernia are to be allowed out of bed on the 11th day postoperative.
h. Patients upon whom pelvic operations have been performed through a Pfannenstiel incision are to be allowed out of bed on the 8th day postoperative.
i. Patients upon whom operations have been performed through right rectus or midline suprapubic incision are to be allowed out of bed on the 9th day postoperative.
j. Patients with postoperative diagnosis of chronic appendicitis only are to be discharged on the 9th day postoperative.
k. Patients with the postoperative diagnosis of inguinal hernia are to be discharged on the 13th day postoperative.
l. Patients upon whom operations have been performed through right rectus, Pfannenstiel or midline suprapubic incisions are to be discharged on the 11th day postoperative.
m. Perineorrhaphy, and trachelorrhaphy cases are to have vaginal irrigations on 2nd postoperative day; then q 2 days therafter.
n. Perineorrhaphy and trachelorrhaphy cases are to be allowed out of bed on 10th postoperative day, discharged on the 12th postoperative day.
o. Rectal cases to be allowed up on the 3rd postoperative day and discharged on the 5th postoperative day.
p. D. & C. Routine.
   (a) Examine for and remove all packing on 1st morning postoperative.
   (b) Ergotol min. xv q. 4 hours for 48 hours.
   (c) General diet 1st morning postoperative.
   (d) Vaginal irrigation (hycol) daily after 1st day postoperative.
   (e) Out of bed on 3rd day postoperative if not bleeding.
   (f) Discharged on 5th day postoperative unless contraindicated.

8. *Information to be Given Staff Patients on Leaving Hospital.*

No patient is to leave the hospital without seeing the Resident or House Surgeon for instructions.
Explain carefully about amount of exercise to be taken.
Explain in detail diet to be followed.
Make out anticonstipation regime (filling in definite hours on blank).
Refer to family doctor or clinic. If clinic, give a clinic card on which diagnosis is written.
Explain about follow-up clinic so that patients will understand why they are wanted back.
Ask patient to report any change of address.

9. *Section of Ophthalmology.*

Intern seeing emergency case or any case necessitating immediate treatment *must* take visual acuity of the patient before touching the eye or instilling drops or ointment. Charts for this purpose are on the second and third floors.
In all cases necessitating treatment by

the Intern, where infection is present, smears should be taken before any instillations.

Where dressings become loosened on postoperative cases, Intern will reinforce them without removing the dressing, carefully avoiding pressure over the postoperative eye.

10. *Section in Urology* (Standing Orders).

a. Acute retention of urine.

(a) To be classed as an emergency demanding hospitalization and immediate attention by the Urological Staff. If Urological Staff is not available then House Staff will have to catheterize.

(b) Catheterization not to be done until decompression apparatus is set up so that when the catheter is passed it can immediately be attached to the apparatus. The decompressor and tubes should be full at the time of connecting with catheter. The trap of the decompressor should be placed at that level to which urine rises at the time of connecting the catheter. If decompression apparatus is not available then a tube should be attached to the catheter before any urine is allowed to flow and by means of gravity urine should be allowed to flow only a few drops at a time. The height of the tube should be lowered each day, so that it should take in all about four days to empty the bladder. A soft rubber 16 French catheter should be used, but if patient cannot be catheterized with this, a 16 French natural curve silk catheter should be used. If for any reason patient cannot be catheterized or cannot bear urethral catheterization, a suprapubic cystotomy under novocaine should be done and the bladder decompressed this way.

(c) Blood chemistry for urea nitrogen should be ordered.

(d) Patient should drink a glass of water every half hour, varying this with orangeade, grapolade, or lemonade. Glucose may be given with this. Diet-milk.

(e) If there has been vomiting and water cannot be retained, clysis may be instituted.

(f) Order s. s. e. daily.

b. Preoperative Preparation for Prostectomy.

(a) Blood urea should be normal.

(b) Phenolsulphonephthalein output should be as nearly staple as is possible to get it, with little variation from day to day.

(c) The bladder should be kept clean with daily washes of mercurochrome solution 1:500.

(d) Patient's heart should be examined and if there is any suggestion of decompensation operation should not take place until the heart is as normal as possible. Patient should be digitalized.

(e) Patient should be able to be up and walking before the operation is contemplated, the ability to walk with the increase in heart rate and dyspnea being the best test of a good heart function.

(f) The patient should have fluids and glucose up to three hours before operation.

(g) s. s. enema should be given morning of operation.

CARE OF FRACTURES IN THE O.P.D. OF THE FIFTH AVENUE HOSPITAL

1. Every case suspected of having a fracture should be examined and cared for under the principles laid down in the "Preamble to the outline of treatment of fractures" which must be read by every member of the staff handling fractures.
2. A fracture having been diagnosed or suspected, adequate treatment should be applied for wounds and the part properly splinted following suggestions afforded in the outline for "Splinting Fractures."

3. The case is to be reported immediately to the House Surgeon or Resident on duty, who will see the case, make such examination as is necessary to confirm or amplify the diagnosis. He will give such advice regarding splinting as will permit the fracture to be roentgenographed as expeditiously as possible and make arrangements for such roentgen-ray examination.
4. The House Surgeon or Resident on duty will see that the fracture case, with roentgen-ray diagnosis, shall be reported to the Attending Surgeon, who will direct the disposal of the case as soon as possible.
5. Special care is to be taken in the following:
   a. Padding splints; use plenty of padding.
   b. Bandage snugly enough to give support and prevent movement, but avoid tight bandages.
   c. Elevate limbs to prevent swelling.
   d. Do not remove splints on new cases coming to hospital until they have been roentgenographed, unless there is some imperative reason to do so.
   e. Where Collins' hitch is used with windlass traction, protect limb with folded towels.
6. All dislocations should be treated as fractures.

SPLINTAGE OF FRACTURES IN O.P.D.

1. *Skull and nasal bones:* Admit to hospital.
2. *Vertebrae:* Admit to hospital.
3. *Clavicle:* Velpeau, sling and swathe, or crucial splint.
4. *Scapula:* Velpeau, sling and swathe.
5. *Humerus,* upper third: Axillary pad, Velpeau, sling and swathe.
   Humerus, middle and lower third: Coaptation splints plus right-angle internal or external lateral. Advise admittance to hospital.
   Elbow. Splint of wood, or anterior or posterior moulded plaster from axilla to metacarpophlangeal joints, in comfortable position.
6. *Forearm,* one or both bones: Internal right-angle splint of wood, from 6 inches above elbow to metacarpophalangeal joints, or anterior and posterior moulded plaster; position, right angle at elbow.
7. *Wrist;* comminuted radius or ulna: Splint to prevent rotation of forearm by wood or single plaster (above elbow).
8. *Hand* and fingers: Flat wooden splint.
9. *Multiple fractures of arm and forearm:* Thomas splint, elbow and hand extended, enough traction to prevent movement and shock. Support limb in Thomas splint with wide strips of muslin or flannel.
10. *Pelvis:* Abdominal complications to be considered and manipulations avoided which might aggravate lesion.
    a. Intraperitoneal hematoma.
    b. Laceration of bladder. House surgeon or Resident to catheterize if advisable.
    c. Laceration of urethra.
    d. Subparietal rupture of viscera. Prevent movement of parts by snugly fitting Scultetus binder about pelvis.
11. *Lower limb:*
    Hip: long side Hamilton splint from axilla to and including foot.
    Femur: Thomas splint with Collins' hitch on ankle. Spanish windlass for traction. Foot piece to prevent rotation with strips to support limb. Piece to elevate distal end of Thomas splint from stretcher.
    Knee: Thomas splint bent to support knee in flexion. No traction, with exception of patella.
    Leg, one or both bones: Fifth Avenue Hospital pasteboard carton splint, reinforced laterally if necessary with wooden splints.
    Ankle and foot: Same as leg or pillow splint.

INSTRUCTIONS TO PATIENTS ON DISCHARGE

For All Patients Discharged to Family Doctor's Care

1. Because you are ready to leave the hospital, does not mean that you are ready to be discharged from all medical care. Your operation has been successfully performed but that is only part of your cure. You still require attention to get the best results from your surgical treatment.

2. When you leave the hospital, go to see your family doctor, or have him come to see you. We are writing a letter to your doctor telling him everything that has been done in your case, with recommendations for further treatment. He will care for you until you are entirely well. If you have no family doctor, be sure to look up one in your neighborhood without delay. Let us know whom you select and we will notify him of your treatment while under our care.

3. You will be supplied with directions as to diet and general care of yourself when you leave the hospital. *Remember that these directions do not take the place of the attention of your doctor.* They merely help him to carry out your further treatment.

4. We will send for you by postal card to come back to see us later for an examination. *Be sure to come when we ask.* We will examine you carefully and make sure that everything is progressing favorably, and will write to your doctor about anything we may find, or any suggestions that we have to make.

5. In the event of any trouble, do not take a chance on treating yourself or following the advice of friends. See your doctor, and if necessary he will get in touch with us.

6. Have your dentist fix all your teeth up. We will tell you what you should have done to them to keep well.

For All Patients on Discharge

1. Because you are ready to leave the hospital, does not mean that you are ready to be discharged from all medical care. Your operation has been successfully performed but that is only part of your cure. You still require attention to get the best results from your surgical treatment.

2. Follow your diet carefully.

3. Get at least eight hours' sleep every night.

4. Have your bedroom windows open every night. Cover yourself as warmly as you care to *but keep the windows open.*

5. Get some open air exercise every day, even if it is only a half hour's walk. If you exercise by walking outdoors, walk briskly, swinging the arms and breathing deeply.

6. Be sure that your bowels move regularly. If they do not, consult your doctor instead of taking patent medicines from the drug stores.

7. Be sure to return for examination when you receive the postal from us.

Instructions to Toxic Goitre Patients on Leaving the Hospital

1. The following instructions should be carefully followed in order to receive the maximum benefit from the operation. Because you are ready to leave the hospital does not mean that no further medical care is required. You will derive the best results from the operation if for the next several months the following advice is adhered to.

2. Eat plain food, milk, eggs, cereals and water are to be taken freely. Avoid red meats, highly seasoned foods and condiments. Do not take tea, coffee, alcohol. Do not use tobacco. Avoid overeating.

3. For the next three months restrict social activities. Avoid excitement. Reduce household or business cares to a minimum. After three months gradually resume your normal business and social life.

4. Spend much time, during your early convalescence, in the open air. Walk and exercise in moderation. Avoid fatigue. Retire about 9 P.M. and try to sleep or remain quiet in bed until 9 A.M. Lie down for one or two hours every afternoon. Then gradually resume your regular habits or rest and exercise.

5. Be sure to keep the bowels regular.

6. Report back to follow-up clinic when sent for, for examination.

Empyema and Lung Cases

1. Because you are ready to leave the hospital, does not mean that you are ready to be discharged from all medical care. Your operation has been successfully performed but that is only part of your cure. You still require attention to get the best results from your surgical treatment.

2. Exercise as you did in the hospital, to expand your lungs.

3. Keep out in the open air as much as possible. Get an outdoor job if you possibly can.

4. Follow your diet carefully.
5. Keep your bowels well open.
6. Stop smoking for at least three months. Your doctor will tell you when it is safe to smoke thereafter.

Gastric Cases

1. Because you are ready to leave the hospital, does not mean that you are ready to be discharged from all medical care. Your operation has been successfully performed but that is only part of your cure. You still require attention to get the best results from your surgical treatment.
2. Follow your diet carefully.
3. Do not overeat at any time.
4. Do not take alcohol in any form for at least three months.
5. Do not smoke or chew tobacco for at least three months.
6. Keep bowels open.
7. Be sure to follow advice as to teeth and nose and throat.
8. Do not do work requiring heavy lifting for at least eight weeks.

Diet for Stomach Cases First Two Weeks after Leaving Hospital

Diet B

Breakfast

Fruit: ½ orange or grapefruit. Prunes.
Cereal: All kinds, with small amount of sugar and plenty of cream.
Egg: Soft-boiled, poached, omelet.
Toast or bread and butter.
Cocoa.

Dinner

Cream soups
Small amount of one of the following:
White meat of chicken
Fish
Roast beef
Roast lamb
Lamp chops
Scraped beef
Baked or mashed potatoes with butter.
Salads of all kinds.
All green vegetables.
Custards, ice-cream, creamed tapioca, etc.

Supper

Milk toast.
Creamed oysters.
Any of above dinner dishes.
Note: Use very little seasoning in food. Eat small amount, and often. Plenty of eggs, milk and cocoa between meals.

Postoperative Diet for Gall Bladder, Stomach and Intestinal Cases

Diet A

General Directions: Take moderate quantities of plain nutritious foods. Avoid excesses of meat, all rich foods, and eat only moderate quantities of starches and sugars.

May Take:

Soups. Meat soups in small quantities, mutton (weak), chicken (weak), beef (weak), oyster, bouillon, rice, tapioca, barley, vermicelli, clamp vegetable.

Lean Meats. Roast mutton chops, lamb chops, broiled, broiled and roasted chicken, broiled or roasted squab, ham, bacon, broiled or roasted birds (once a day).

Fish. Raw, broiled, or stewed oysters, broiled or boiled rock, bass trout or bluefish.

Eggs. In small quantity, coddled or soft boiled.

Vegetables. Spinach, young peas, string beans, potatoes, (baked, small quantity), turnips, cauliflower, cabbage, lettuce (without vinegar), celery, cresses (without vinegar), onions.

Farinaceous Foods. Rice in small quantities, oatmeal, cornstarch, sago, tapioca, arrowroot, hominy, grits, vermicelli, cream of wheat, stale wheat bread, toast, graham bread, rye bread, corn bread, pulled bread, swieback.

Desserts. Blanc-mange (no sugar), custards (no sugar), rice pudding (no sugar), tapioca pudding (no sugar), bread pudding (no sugar), milk pudding.

Fruits. Lemons, oranges, apples (tart) raw, baked or stewed, stewed apricots, raw or stewed peaches, stewed prunes, stewed cherries. Fruit to be stewed without sugar.

Fatty Foods. Butter.

Drinks. Taken mainly with meals. Milk, buttermilk, peptonized milk, milk with vichy, milk flavored tea or coffee, kefir, kumiss, junket whey, lime juice or lemonade, (without sugar), water, hot water, mineral water, vichy, apollinaris poland, lithia, carlsbad.

Must Not Take:

Rich soups, fried foods, hard boiled eggs, pork, veal, stews, hashes, turkey, corned meats, potted meats, liver, kidney, duck, goose, sausage, crabs, lobsters, preserved fish,

smoked fish, salted fish, salmon, salt mackerel, sardines, radishes, mushrooms, asparagus, tomatoes, dried beans, old peas, pickle, sweet potatoes, beets, hot breads or cakes, nuts, candies, preserves, pies, pastry, rich puddings, cheese, strong tea or coffee, alcoholic stimulants, sweet wines, ice cream, stewed berries, cider.

Appendectomies

1. Because you are ready to leave the hospital, does not mean that you are ready to be discharged from all medical care. Your operation has been successfully performed but that is only part of your cure. You still require attention to get the best results from your surgical treatment.
2. Follow your diet carefully.
3. Keep your bowels well open by your diet and by taking one tablespoonful of mineral oil every morning and night. If you still have trouble, tell your doctor, don't resort to patent medicines.
4. *Do not overeat.* Eat less at one time, and more frequently.

Anal Cases

1. Because you are ready to leave the hospital, does not mean that you are ready to be discharged from all medical care. Your operation has been successfully performed but that is only part of your cure. You still require attention to get the best results from your surgical treatment.
2. Take hot sitz baths, such as you had in the hospital, twice daily for one week. Your doctor will advise you as to continuing them for a longer time.
3. Sponge anus with warm water after each bowel movement.
4. Keep bowels well open. If they do not move readily and easily see your doctor instead of trying patent medicines.
5. Avoid violent cathartics, such as salts, etc.
6. Take a tablespoonful of mineral oil three times daily.
7. Have your bowels move, if possible, at same time each day.
8. Follow your diet list.
9. Do not take enemas unless your doctor advises you to.

Gall Bladder Cases

1. Because you are ready to leave the hospital, does not mean that you are ready to be discharged from all medical care. Your operation has been successfully performed but that is only part of your cure. You still require attention to get the best results from your surgical treatment.
2. Follow your diet carefully.
3. Never eat heavy meals. It is better to eat smaller meals more often.
4. Keep your bowels well open. If you have difficulty in so doing, don't take patent medicines, but see your doctor.

Hernia Cases

1. Because you are ready to leave the hospital, does not mean that you are ready to be discharged from all medical care. Your operation has been successfully performed but that is only part of your cure. You still require attention to get the best results from your surgical treatment.
2. For two weeks after leaving hospital do no lifting or straining.
3. For four weeks after leaving hospital do no *heavy* lifting. Light lifting allowed.
4. After four weeks from time of discharge from hospital any work can be done.
5. Wear suspensory bandage or supporter for eight weeks after leaving hospital.
6. Follow general instructions.

Patients upon Whom Perineal Repairs Only Have Been Done

1. Same as in other instructions.
2. If you have a discharge from the vagina, it is nothing to worry about. As long as it is annoying take a douche of 2 quarts of hot water in which a tablespoon of soda bicarbonate (baking soda) has been added. Do not have the douche bag more than 2 feet above your hips. Take at least 20 minutes to run through the 2 quarts. Take the douche lying down. If discharge continues more than 1 month consult your doctor.
3. You will probably have pains near your rectum for some months after operation. Be sure you keep your bowels open in order that you may not develop hemorrhoids.
4. Refrain from intercourse for 1 month.

Directions for Fracture Cases Leaving the Hospital

You are not well yet. Your stay in the hospital was for the purpose of doing all the surgeons could and deemed proper to correct the injury to the bone. We have tried to obtain the best position of the pieces of the broken bone, so that you can get the best use in the

quickest time. We want you to know that this does not mean that the bones are in perfect position. This rarely happens; but we feel that you will recover so that you will be able to use the injured part again. You will have to be cared for and directed what to do until the bone has grown solid again or "knit," and the muscles have become strong. While this is taking place at home, you are to keep your foot or hand above the level of your heart to keep the swelling away, as frequently as possible.

Come to the Clinic the day after you leave the hospital at nine o'clock in the morning, or see your doctor. Your doctor can find out from the hospital what was wrong with you, and what was done for your injury. Pay attention to what the doctor tells you, and do as he says. If you go to your own doctor he is responsible for your care.

1. You will have to be told when the dressings are to be removed.
2. How you are to move your joints.
3. What to do when you have pain.
4. When to use the limb and how much.
5. What you must do to get your muscles strong again.
6. When you can go back to work.

If you cannot see your own doctor you can wait and come to the Surgical Clinic 9 to 10 every morning, except Sunday.

If there is anything wrong, come back to the hospital any time day or night and the doctor will tell you what to do.

Improvement in fracture goes on for a period up to several years.

ADVISABILITY OF ROENTGENOGRAPHING SINUS TRACTS FOR DIAGNOSIS*

Frederic W. Bancroft, M.D., F.A.C.S.

NEW YORK

FREQUENTLY the surgeon observes sinuses which apparently can be accounted for by the history obtained from the patient, by the physical examination and by the flat roentgenograms. Nevertheless, often very valuable data may be obtained by the injection of these tracts with lipiodol or some similar substance and another roentgenogram taken. In the author's experience in 2 recent cases the operation would have been a failure had not the additional data been obtained from the injection of the tracts to be roentgenographed. The case histories and roentgen-ray photographs are given in these cases, as they seem to illustrate the necessity for this further study:

In Case 1 there was a history of what was presumably an osteomyelitis. The patient had a discharging sinus below the posterior gluteal fold. The roentgenogram showed evident osteomyelitis of the ischium. Had we not injected the sinus and taken the roentgenogram, the operative procedure on the ischium would have resulted in complete failure.

In Case 11 the diagnosis was made by the roentgenogram. We were prepared, from our knowledge of the distribution of the sinus tract, for an extensive operative procedure, and therefore the operation was successful. We would not have recognized the condition had we not had a roentgen-ray picture of the injected tract.

Two cases of osteomyelitis with sinuses are reported wherein the injection of the sinuses confirmed the diagnoses and definitely outlined the operative procedure:

Case 1. Miss A. D., a woman aged nineteen, was admitted to the Fifth Avenue Hospital on February 13, 1929. Three years ago she began to have right hip pain and was unable to walk. She was treated then and kept in bed for one and one-half months. Six

* From the Surgical Service of the Fifth Avenue Hospital. Submitted for publication April 20, 1929.

months later she had a discharge on the inner side of the right leg. The sinus was curetted, drained and packed for the last two years.

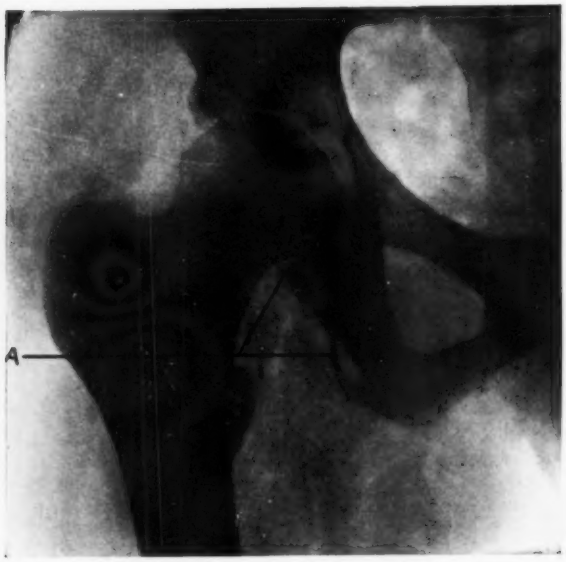

Fig. 1. Case 1. Flat roentgenogram showing bone changes in ischium (A) suggesting osteomyelitis.

It has cleared up three times for comparatively short intervals. The patient complains of pain only when the lesion heals and fails to drain. Her main complaint is that she is unable to flex her thigh in climbing stairs.

Physical examination showed a well-nourished and well-developed white female in no acute distress, and was essentially negative save that there is a sinus tract leading from the medial aspect of the right buttock up into the gluteal region; otherwise not remarkable. Movement of the lower limb was limited on abduction and flexion, but motion was not impaired or abnormal otherwise.

Roentgen-ray Findings. Stereoscopic films of the right hip and pelvis after the injection of lipiodol into the sinus on the posterior surface of the thigh show that the sinus tract runs upward to the bony process in the ischium and then around the posterior portion of the hip where it divides into two sinuses. It then travels toward the median line in one sinus tract until it enters the rectum. A film made several hours later shows the lipiodol in the rectum. (Figs. 1 and 2.)

Operation. The injection of lipiodol into the sinus tract had shown that the tract ran upwards to the ischium where there was an area of osteomyelitis, and then back of the hip joint around into the posterior portion of the pelvis about the level of the fourth sacral vertebra and entering the rectum at this region. It had been impossible to see the entrance of

Fig. 2. Case 1. Injected sinus tract (A) showing tract extending through bone tunnel in ischium (C) and then posterior to head of femur and into rectum (B).

the tract into the rectum by proctoscopic examination; therefore it seemed advisable to close the fistula by the abdominal route. Patient was placed in a high Trendelenburg position and a left paramedian incision from the pubis to above the umbilicus was made. The intestines were brought well out of the pelvis. The uterus was grasped with the tenaculum and held upward. At the beginning of the anesthesia two ureteral catheters had been inserted by cystoscopy into the ureters in order to make their differentiation easy. On palpation the right ureter could be easily felt and identified. The posterior peritoneum was split a little below the promontory of the sacrum and dissected downward to the utero-sacral ligament, and the rectum dissected downward. It was found necessary also to separate the peritoneum at the cul de sac on the posterior surface of the cervix. An assistant with a finger in the rectum from below warned the operator of any approach near the rectal mucous membrane. It was found on dissection downward that the rectum was densely adherent on the right side of the pelvis

from the sacrococcygeal junction upward. By blunt dissection proceeding from the muscle, in order not to cause a rent in the rectum where it would be difficult to repair, the rectum was gradually separated from the pelvis. The procedure was long and arduous, on account of the density of adhesions. Finally the sinus tract was located and cut across. A probe was inserted through the lumen into the rectum at this junction and at distal portion of the tract a sound could also penetrate, thereby identifying the tract. The sinus opening into the rectum was closed with interrupted sutures of Pagenstecher and reinforced with fine chromic gut. It was impossible to do anything to the distal portion of the tract as it was right at the pelvic junction. A cigarette drain was inserted down to the pelvic area and the posterior peritoneum closed as an apron around the uterus so that the entire area of the rectum was walled off from the general peritoneal cavity. The abdominal wound was then closed in layers in the routine manner, the cigarette drain coming out of the lower angle of the incision. (Figs. 3 and 4.)

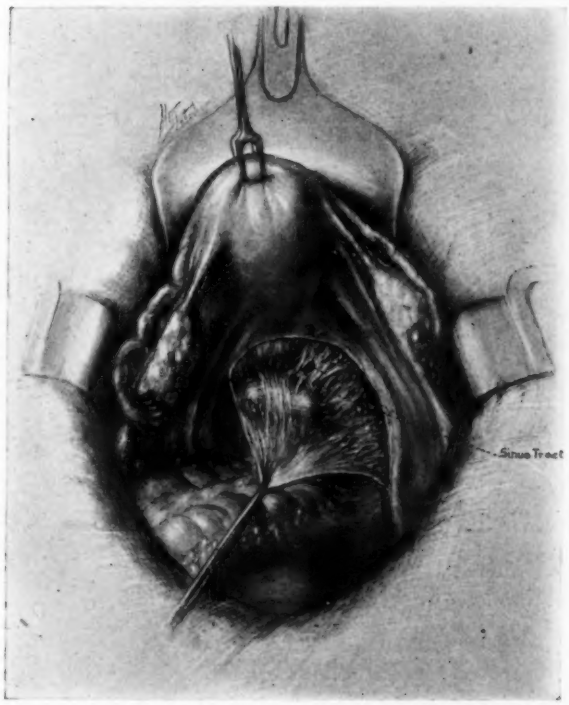

Fig. 3. Case 1. Artist's sketch at operation showing reflection of peritoneum and sinus tract.

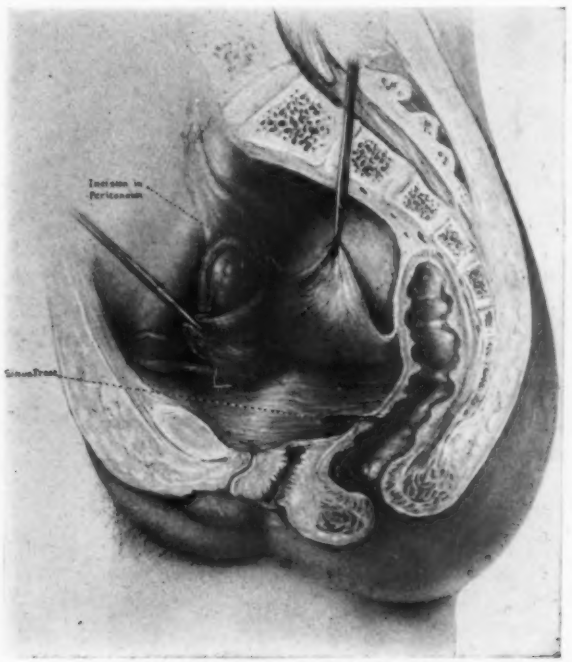

Fig. 4. Case 1. Diagrammatic drawing showing location of sinus entrance into rectum.

Comment. This patient, it is assumed from her history, had an attack of acute osteomyelisit of the ischium. She says that her leg was swollen and tense at the time of her illness, when she was running a high fever. Her sinus in the thigh did not open until six months after she was out of bed. Her first flat roentgenogram revealed the osteomyelitis. With the injection of the sinus it was discovered that the tract ran to the area of osteomyelitis in the ischium and then upward and posterior and entered into the rectum anterior to the sacrum. It is assumed therefore that while she was in bed pus burrowed down the deep planes of the thigh and perforated into her rectum. Later, when she was up and about, the secondary abscess broke on the posterior surface of the thigh, forming her present fistula. Methylene blue injected into the sinus was recovered by a rectal enema. We could not, however, see the orifice by proctoscopic examination. It is obvious that any operation on the ischium would result in failure because the sinus tract would constantly be reinfected from the rectum. Considerable thought was placed upon how to approach and close the rectal sinus. It could have been done either by going up in the lateral pararectal fossa or by splitting the vagina or by a posterior Kraske approach. It seemed wisest, however, to approach through the abdomen, split the peritoneum and dissect downward along the lateral wall of the rectum. This was done, but the procedure was very

difficult as the section had to be carried downward to within about 2 inches of the anus.

Postoperative Course. The patient did well

Fig. 5. Case II. Roentgenogram of foot before and after injecting tract. A, Sinus orifice; B, junction of sinus and extensor longus pollicis tendon sheath; C, tendon sheath.

for about ten days and then developed temperature and pain in the right lower quadrant with a palpable mass. She was handling the infection well and it was thought best to temporize and see which way the infection would point. It was felt that if it were opened by the abdominal approach, if the hole in the rectal wall had not been completely closed a fecal fistula might result and if drained either by rectum or lateral to the rectum the same difficulty might occur. Fortunately the patient had a sudden discharge of pus through the vagina and her temperature and symptoms immediately subsided. The sinus on the thigh closed three days after the operation and has now remained closed for somewhat over two months. There is no induration or tenderness. She is able to flex her thigh without pain and I believe will remain well.

Case II. Mr. D. S., an Armenian twenty-two years of age, was admitted to the Fifth Avenue Hospital on March 3, 1929, with a history of a draining sore on the foot. Two months before the patient had noted a small white swelling on the dorsum of the right foot. This was painless except that there was an occasional twinge when he extended the great toe. He visited a doctor who said there was some fluid present which would probably disappear. The condition remained the same for about one month, giving him no pain on walking or other symptoms. About four weeks ago he began to have redness and swelling of an area on the dorsum of the foot. He visited a doctor, who opened it and got out some dark red material but very little pus. It was treated with elevation and hot soaks. He had pain when he lowered the foot but not otherwise. The wound healed and then the foot suddenly became swollen and very painful but this was relieved when the patient squeezed the area and evacuated a large quantity of pus. Since that time he has had a draining sinus from which he could express pus by pressing over the dorsum of the great toe and points proximal over its extensor tendon.

Physical examination was essentially negative save that over the dorsum of the right foot over the tarsometatarsal junction there is a draining sinus, with an area of inflammation the size of a dime surrounding. The swelling extends distally along the extensor longus hallucis tendon and pus exudes from the sinus on pressure over this. There is pain on pressure over the base of the great toe.

Roentgen-ray Report. Films of the right

foot in the anteroposterior and lateral directions show no roentgen-ray evidence of bone or periosteal infection. Stereoscopic films were

Fig. 6. Case II. Later roentgenogram of tract.

made of the right foot after the injection of lipiodol into the sinus on the doral surface of the foot. The lipiodol runs upward for a distance of about 1.5 inches from the opening of the sinus and down the dorsal surface of the foot over the metatarsal bone of the great toe to the region of the base of the proximal phalanx of the great toe. The course of the lipiodol is along the tendon sheath. At no point does it communicate with any bone and the entire solution is in the soft parts. I am unable to detect any evidence of bone or periosteal involvement. (Figs. 5 and 6.)

Operation. An incision was first made over the distal portion of the tendon at the metatarsophalangeal joint. The appearance of the tendon and the character of the granulations suggested a tuberculous process. The incision was therefore lengthened as far upward as the ankle joint, and the complete synovial sheath, which appeared diseased throughout with sluggish-appearing granulations, was dissected free from the tendon and excised. The sinus tract from the skin entrance to the tendon sheath was also excised. The wound was thoroughly washed with ether and the fascia was sutured over the tendon with interrupted

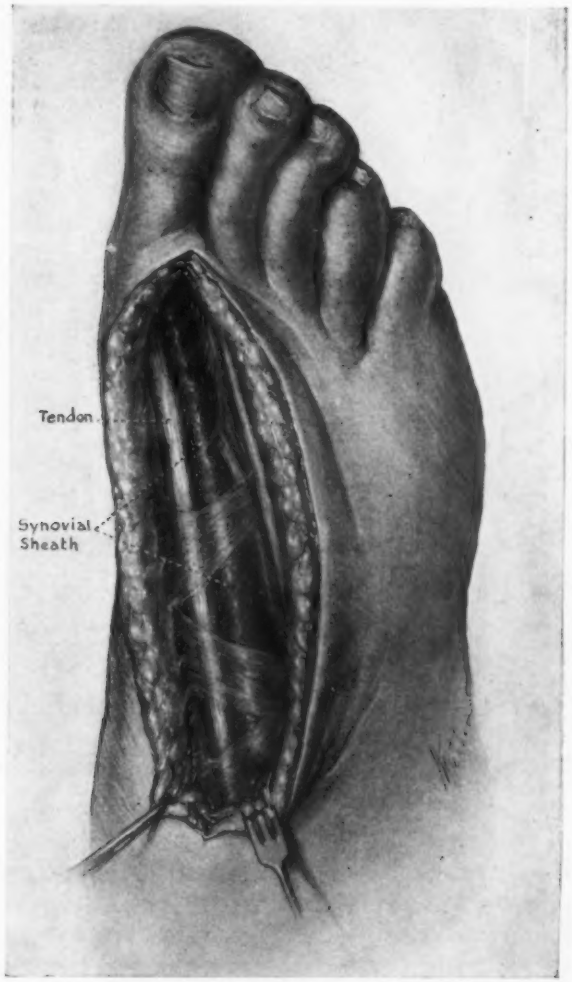

Fig. 7. Case II. Artist's sketch at operation.

No. 00 chromic gut sutures. The skin was united loosely with interrupted Stewart fine dermol sutures. The foot was put up at right angles with a posterior plaster-of-Paris molded splint. (Figs. 6 and 7.)

The pathological report of the tissue removed shows a tuberculous tenosynovitis. There are numerous giant cells, tubercles, and areas of chronic inflammation.

Comment. The plain roentgenogram showed no bone involvement. The injection of the sinus showed that the tract ran mesial for about an inch from the entrance of the sinus and then its distribution coincided with that of the tendon sheath. After the original incision elsewhere the patient undoubtedly had a secondary infection. An excision of the

entire sheath was followed by rather slow but complete healing of the wound.

Case III. Mr. R. D. was admitted to the

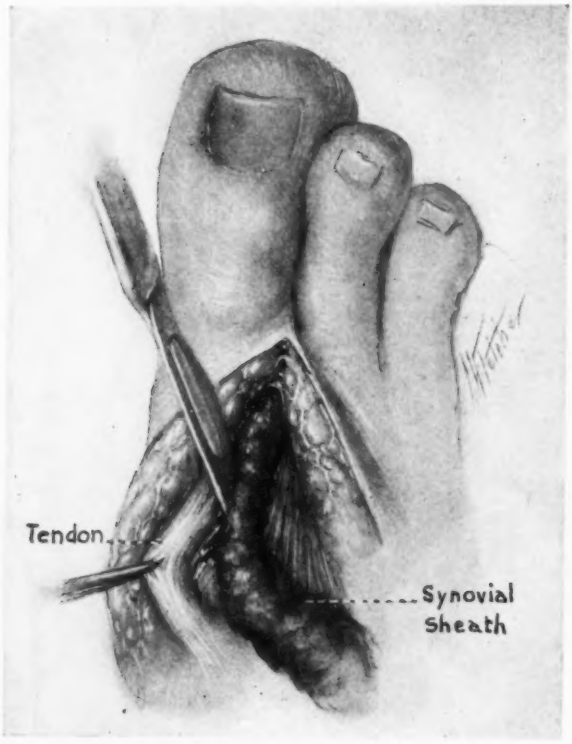

Fig. 8. Case II. Artist's sketch showing method of synovial sheath excision.

Fifth Avenue Hospital on April 8, 1928, giving a history of pains in the right leg and foot of four months' duration. Ten years ago he was struck with shrapnel in the right leg. For the next year and a half he was confined to bed in various hospitals in England, France and Scotland, where nine or ten operations were performed on his leg. The patient says that the operations were done to remove pieces of shrapnel, scrape the bone and remove diseased bone.

For a considerable period of time this patient had non-union and had several operative procedures to remove pieces of bone. Finally union occurred, although there was a certain amount of deformity. For the last six months he has been suffering from a discharging sinus in the middle of his leg and another area which occasionally breaks down on the anterior surface of his tibia immediately below the tibial tubercle. Occasionally he gets cramps in that leg. The patient walks, using the outer side of the right foot. When the foot is everted pain is felt along the medial arch and behind the medial malleolus.

Physical examination was essentially negative

Fig. 9. Case III. Flat plate showing chronic osteomyelitis near head of tibia and sequestrum (A).

except that on the anteromedial surface of the tibia of the right leg are two wounds, one in middle of leg, which is superficial, discolored and covered with a thick bloody crust about ½ inch long. This wound is not discharging nor is it tender. In the upper third of the shaft of the tibia, 1 inch medial to the tibial tubercle, is another wound 2 inches long, diamond-shaped and 1 inch deep. The wound is not discharging and is tender only at its inferior angle. The skin covering the wound is red, shiny and smooth. In the center of the wound there is a small crust of blood and serum. On the lateral aspect of the leg are two scars. Also over the inner condyle of the tibia there is another scar. The right leg as a whole is

deformed. There is a bowing posteriorly. The head of the fibula is displaced posteriorly and its outline down the leg is lost for a considerable

Fig. 10. Case III. Injection of sinus tract (B) with injection travelling to sequestrum (A).

distance. The leg is 1⅛ inches shorter than the left leg. Sensory nerve endings are disturbed in the right leg. There is a diminution in pain sense throughout the entire leg. On the plantar surface of the right foot tactile sense is increased. Sensations of heat and cold are not disturbed. Movement of the leg is not interfered with. There is a diminution of muscle tone and muscle strength.

Roentgen-ray Report (April 9). Films of the right leg in the anteroposterior and lateral directions show the tibia altered in shape, density and structure from a former infection and surgical operations. The fibula shows rather definite bowing but no areas of bone destruction and no definite periosteal change. No evidence of sequestrations or active bone

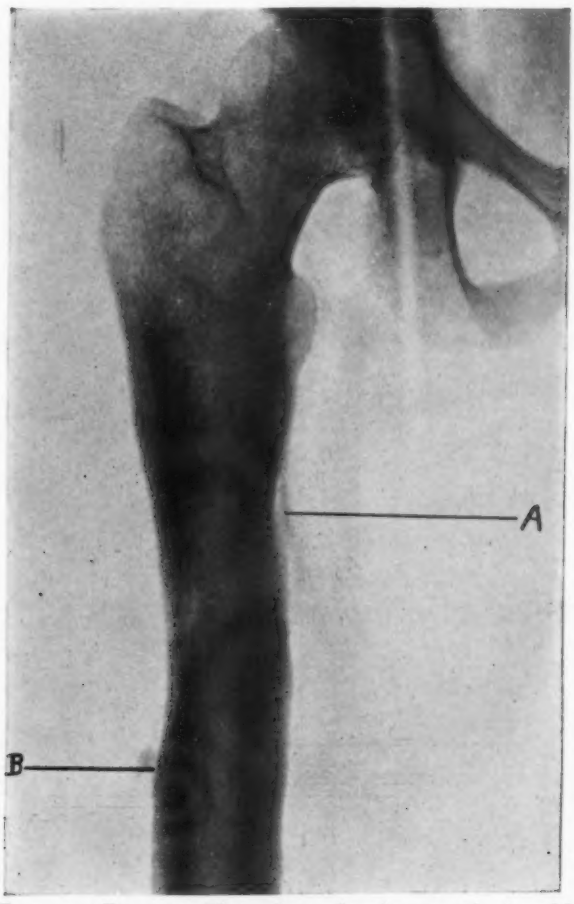

Fig. 11. Case IV. Flat plate showing repair in old osteomyelitis of femur with cortical sequestra (A and B).

infection in the tissue can be detected. In the posterior portion of the leg 6 inches below the knee joint and directly behind the middle of the tibia there is a small irregular calcified area. This is either a calcification resulting from operative procedure or it is a small bit of detached bone. It is not evident from the roentgen-ray appearance whether or not it is associated with the sinus. (Fig. 7.)

Roentgen-ray report (April 11): Stereoscopic films of the right leg after the injection of lipiodol into the sinus show the sinus tract outlined distinctly. The calcified area seen in the plain films lies in the sinus tract and the lipiodol is seen surrounding it. We believe this is a small bit of detached bone. (Fig. 8.)

Operation. An elliptical incision was made along the mesial border of the tibia. The

muscles and scar tissue were bluntly dissected free from the posterior surface of the tibia and the cavity in which the sequestra lay was

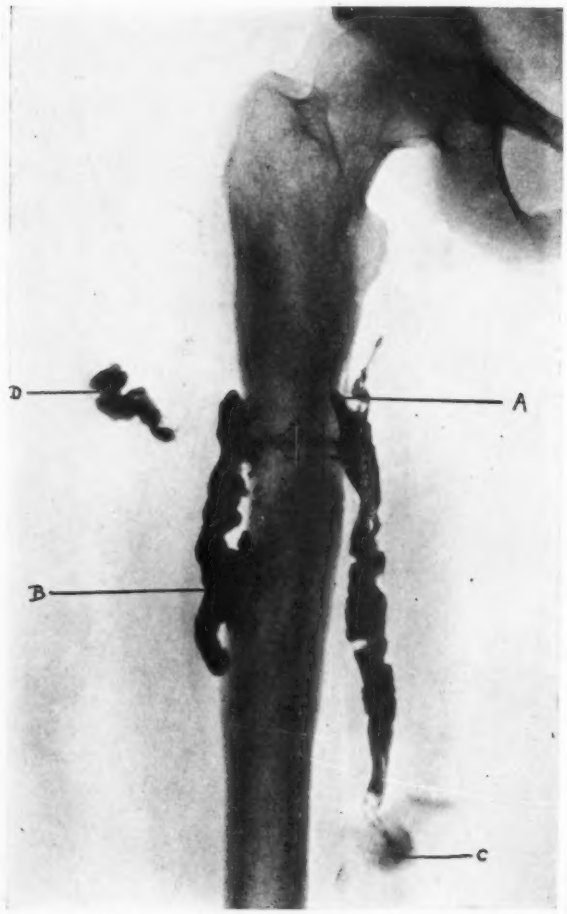

Fig. 12. Case iv. Injection of sinus (c) with lipiodol. A and B, cortical sequestra; D, previous sinus to skin, now closed.

opened. This was grasped by a Kocher clamp and removed. It was thought unnecessary to attempt to dissect out the tract as with the removal of the foreign body it would probably close. The wound was left wide open and Dakinized in order to assure that there would be no secondary infection. The scar was removed from the upper area where the skin was attached to the old cavity in the tibia and with a fine curette this area was gently explored. There was no evidence of any infection; the bone was cancellous in type. There was no evidence of any sinus tract or sequestrum. A plain gauze dressing was inserted over this area. The remainder of the other wound was treated with vaseline gauze and Carrel tubes.

Comment: (See Case iv.)

Case iv. Miss V. S. was admitted to the Fifth Avenue Hospital July 21, 1927. She gave a history of a draining sinus in her right thigh for the past six months. A painful swelling in the left thigh about nine years ago was opened and drained for three months. She had a high fever at this time and also a similar swelling in the left arm, which was drained. Her present trouble began about eight months ago with a painless small swelling on the right thigh, which opened with serous discharge and has been draining continuously since. There is no pain, no fever, no interference with motion. Drainage is the only symptom present.

Roentgen-ray Report (July 18). Stereoscopic films of the right hip and upper half of the femur show a definite bone process involving the upper third or half of the femur from just below the lesser trochanter downward. There is an area of bone destruction apparently encircling the cortical portion of the shaft about 1½ inches in length. There is marked cortical thickening above and below this area. There are some calcifications in the soft parts along the involved areas which are either periosteal hypertrophy or calcifications in the soft tissue from the chronic infection. We believe these changes are infectious in origin and of the type of a low-grade osteomyelitis, and the source of the sinus in the thigh. (Fig. 9.)

Roentgen-ray Report (July 22). The sinus in the thigh was injected with lipiodol and stereoscopic films were made in the anteroposterior and lateral directions. The sinus tract is shown distinctly. It runs upward and inward and backward to the involved area in the femur, then behind the femur and down the outer border for a distance of about 3 inches. There is a blind tract running outward from the area of bone destruction. This is located somewhat posteriorly and does not reach the surface. Along the inner margin of the destructive area in the shaft of the femur there is a narrow area of increased density which probably represents a sequestrum. (Fig. 10.)

Operation. A semielliptical incision with convexity toward the ventral surface was made, and a fascia lata incision in the same line. There was a dense scar-tissue membrane surrounding the femur. When this was penetrated a sinus tract was encountered lined with a sluggish granulation tissue. The tract went posterior to the femur in the area shown in the roentgen ray. A small sequestrum was removed on the anterolateral surface of the femur; another larger one was removed from the

anteromedial surface. Both these sequestra were identified as showing in the roentgen-ray. The tract was well opened up. The pocket extending laterally in the vestus externus was continued to the skin so that tubes could be inserted through this tract and allow a gravity drainage. Three rubber rubes were inserted through this counterdrainage incision. The original wound was closed loosely with silkworm sutures, gut sutures through the skin, fat and fascia lata.

Comment on Cases III and IV: These 2 cases had discharging sinuses with a history of previous osteomyelitis. In each there were one or two sequestrae in the soft parts. After injection of the sinuses with lipiodol it was proved that the reason the sinuses continued to discharge was due to the sequestrae located in the soft parts. The removal of the sequestrae without any further procedures on the shafts of the long bones was followed by prompt closure of the sinuses and recovery of the patients.

CONCLUSIONS

1. Four cases are reported wherein the injection of the sinus tracts with lipiodol and roentgenograms taken established a diagnosis.

2. In Case I an unnecessarily mutilating procedure would have been performed with subsequent failure had not the diagnosis been made of the continuation of the tract entering into the rectum.

3. In Case II the diagnosis was made, from the roentgen-ray, of tuberculous tenosynovitis and the operative procedure planned.

In Cases III and IV simplified operative procedures were performed with resultant cure. Had not the tracts been roentgenographed more mutilating operations on the shaft of the femur and tibia might have been performed.

I wish to express my gratitude to Dr. Lewis Gregory Cole and Doctor Robert E. Pound for the excellent roentgenograms and diagnoses which were made in these cases.

NASAL ACCESSORY SINUS DISEASE & MASTOIDITIS IN INFANTS AND YOUNG CHILDREN*

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NEW YORK

IN this article we propose to discuss briefly the embryology of the face, to call to your attention certain anatomical facts in relation to the accessory sinuses of the nose and the ear in children and the remote effect of these structures as foci of infection, and purposely avoid a discussion of the part played by the tonsils and the other structures of Waldeyer's ring.

EMBRYOLOGY

The upper part of the face, that is, that part which lies above the mandible, is formed by the growing down of the frontonasal process which ultimately develops the nasal septum, the outer nose, the central portion of the upper lip, that portion of the upper jaw which lodges the incisor teeth, and probably also the ethmoid labyrinth. The lateral part of the face including the eyes, the maxilla, including the antrum, the inferior turbinate and the hard palate develop from the lateral or maxillary processes. As these structures infold to unite with each other, they carry with them the developing blood vessels and their capillaries, and the

* Read before the Staff of the Fifth Avenue Hospital, New York, April 5, 1927.

various lymphatics or lymph spaces. From the mechanism of this method of development of the face we can, by "back tracking" so to speak, determine the manner in which lymph drainage takes place from these elements to the more central chains of lymph glands.

FIG. 1. Lateral view of left nasal passage in infant six months old, showing relationship of three turbinals, floor of nose and Eustachian tube. Broom straw will be seen emerging from nasal duct.

POSTNATAL ANATOMY

Onodi in 1911 produced his very exhaustive work on the accessory sinuses in children and demonstrated the presence of all the sinuses at birth. He called the frontal recess or infundibulum, the frontal sinus and used these terms interchangeably. Our own conception is that the infundibulum should not be called the frontal sinus until it has actually invaded the frontal bone. With this conception of the situation we may say that the frontal sinus is the only one not present at birth.

In 1920 Schaefer published his work on "The Nose and Olfactory Organ." In this work he demonstrates the early development of the accessory sinuses, and speaks of a well-developed maxillary sinus as early as the 120th day of fetal life. The ethmoidal cells develop as early if not earlier, and when seen at birth, are the best developed of the accessory sinuses. The frontal sinus, the anterior ethmoidal cells and the maxillary sinus drain into the middle meatus of the nose. The posterior ethmoidal cells and the sphenoidal sinuses drain into the upper part of the naso-pharynx. Drainage from the middle meatus is downward and backward to the naso-pharynx and region of the pharyngeal

FIG. 2. Lateral view of left nostril of infant four days old, showing three turbinals, low position of inferior turbinate, and broom straw in Eustachian tube.

orifice of the Eustachian tubes. It will be obvious therefore to the thoughtful, that posture plays an important rôle in the drainage of these sinuses and also in the drainage from these sinuses to adjacent parts. Mothers should be instructed therefore to change the posture of the sleeping infant frequently, so that drainage may be favored from the Eustachian tube orifices. Lying on the belly should be encouraged.

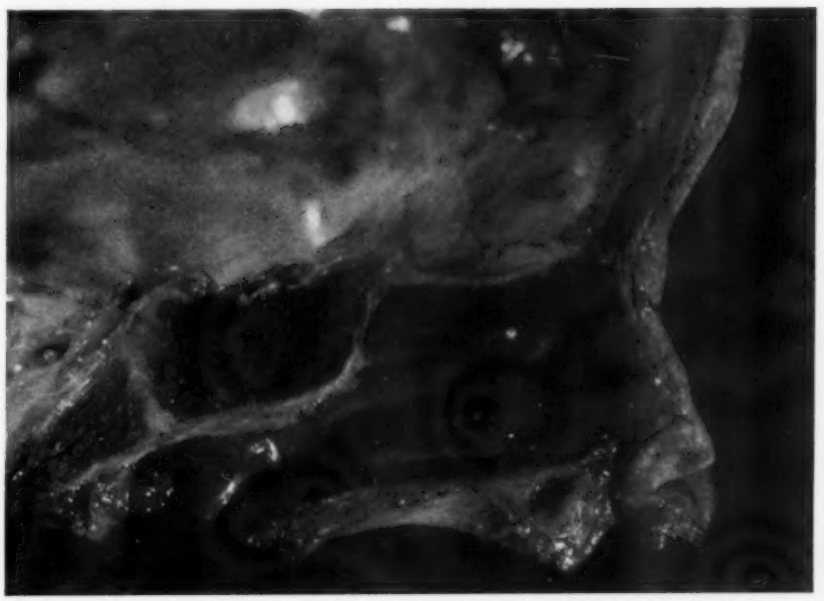

FIG. 3. Outer wall of left nasal chamber in infant one year fifteen days old, showing same general appearance as preceding pictures. Note obvious drainage from nasal chambers into region of Eustachian tubes.

LYMPHATICS

The periosteum of bone is richly supplied with lymphatics; they have been described in the Haversian canals. They are absent in cartilage and probably in bone marrow. Lymphatics of the nose drain into the parotid lymphatics the retropharyngeal glands, the superior deep cervical glands and then into the jugular trunk, in close relation to the jugular vein.

FIG. 4. Outer wall of left nasal passage of infant nine months of age. Middle and superior turbinates removed, infundibulum uncovered showing its extent at this age; posteriorly, sphenoidal sinus may be seen quite well-developed.

The lymphatic vessels of the muco-periosteal lining and walls of the nasal fossae terminate in the postpharyngeal lymphatic glands and the superior deep cervical lymphatic glands. Through the cribriform plate of the ethmoid bone these vessels communicate with the intracranial lymphatics and the subdural space, affording a channel through which meningitis may be produced by caries of the upper portion of the wall of the nose. Involvement of the postpharyngeal, internal maxillary, parotid and superior deep cervical lymphatics may result from disease of the nasal fossae.

Fig. 5. Outer wall of left nasal chamber of infant six months of age. All three turbinates removed. Broom straw may be seen in nasal duct. Infundibulum may be seen reaching forward to floor of frontal bone, and posteriorly, a well-developed sphenoidal sinus is again seen.

The lymphatics of the middle ear terminate in the posterior auricular and parotid lymphatic glands. The lymphatics of the internal ear terminate in the tympanic and intracranial lymph vessels.

Fig. 6. Outer wall of right nasal chamber of infant six months of age, showing characteristic drainage to tubal region.

With a definite communication between the lymphatics of the nasal chambers and the cranium and internal and middle ear it is not difficult to explain the develop-

ment of both the nerve and obstructive types of deafness, which are manifested later in the life of the individual.

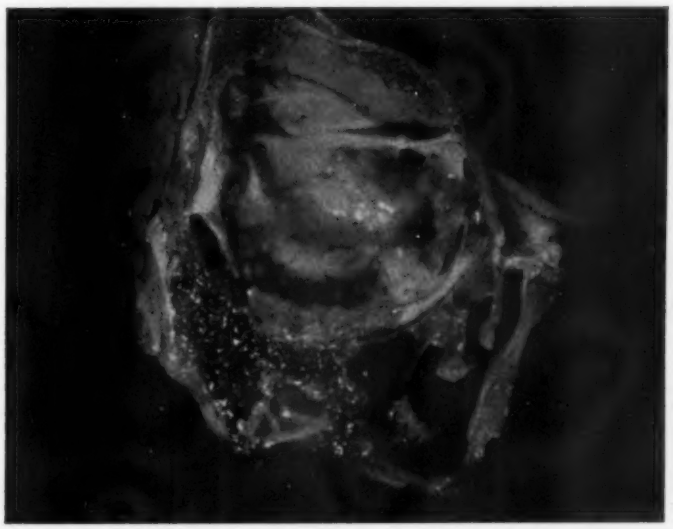

Fig. 7. Transverse section through right nasal chamber and orbit of infant six months of age, showing nasal septum, hard palate, nasal chamber, three turbinates, and maxillary sinus.

ANATOMICAL RELATIONS

To understand accessory-sinus disease one must recognize the fact that no "locked door" separates the cavity of the sinus from the cavity of the nose, and that in an infection of the nasal passage, one cannot assume immunity for the sinus; both are involved always to a greater or less extent.

The Eustachian tube is the direct means of communication between the nasopharynx and the middle ear. It is a collapsed tube in its cartilaginous portion. The pharyngeal orifice in the infant is on a level with, or slightly below the level of the hard palate, thus favoring direct drainage into the tube itself. The tube in the infant is shorter than in the adult and opens into the upper part of the tympanic cavity. The tympanic cavity opens pos-

Fig. 8. Horizontal section through left nasal chamber of infant nine months of age, at level with upper border of inferior turbinate. Anteriorly, nasal duct may be seen, then maxillary sinus; posteriorly, floor of a well-developed sphenoidal sinus.

teriorly by way of the aditus directly into the mastoid antrum. At birth there is no mastoid process, there is only the mastoid

Fig. 9. Horizontal section through orbit and right nasal chamber of infant twenty-two days old, showing broom straw in nasal duct, inferior turbinate, maxillary sinus, and floor of orbit.

antrum and again there is no door to prevent involvement of the antrum; when one is infected the other of necessity is likewise infected.

From this review of the anatomy of these parts one is forced to recognize:

1. The likelihood of accessory-sinus infections not only being complications of, but being a component part of every nasal infection.

2. The likelihood also of otologic involvement being not only associated with, but also being a component part of nasal infection.

3. The possibility and the probability of systemic involvement with these structures acting as primary foci.

Most of the misconception regarding accessory-sinus disease is a direct result of the fact that the subject was approached first by having our attention drawn to the extreme types of this disease, namely the "locked-in-empyema" with its pain, pus and positive roentgen-ray findings. This type of case we may say today is the rare type and the type most frequently existing is the type most frequently unrecognized, that is the type in which the sinus becomes

Fig. 10. Horizontal section through right orbit and right nasal chamber of infant nine months old. On level with middle of ethmoid labyrinth, at left, will be seen roof of these cells. On right may be seen broom straw in nasal duct together with well-developed cells, and posteriorly, sphenoidal sinus.

infected as a direct complication of the general nasal infection and which by reason of its anatomical characteristics is afforded drainage and therefore produces no pain, is negative to roentgen-ray findings and produces only symptoms referable to a focus of infection.

We find in recent literature reports of the same pathologico-anatomical situation in the so-called antritis cases, in otological practice. Here the infant's antrum becomes an overflow reservoir for the infected middle ear, and immediately there obtains an antritis which if not evacuated becomes a focus of infection.

All pathological processes produce certain permanent tissue changes, microscopic at first, involving only certain

isolated cells, but as the same sort of attacks are repeated more and more damage is done until the changes become

Hajek found a chronic recurring erysipelas of the face cured only after discovering a chronic suppurating antrum.

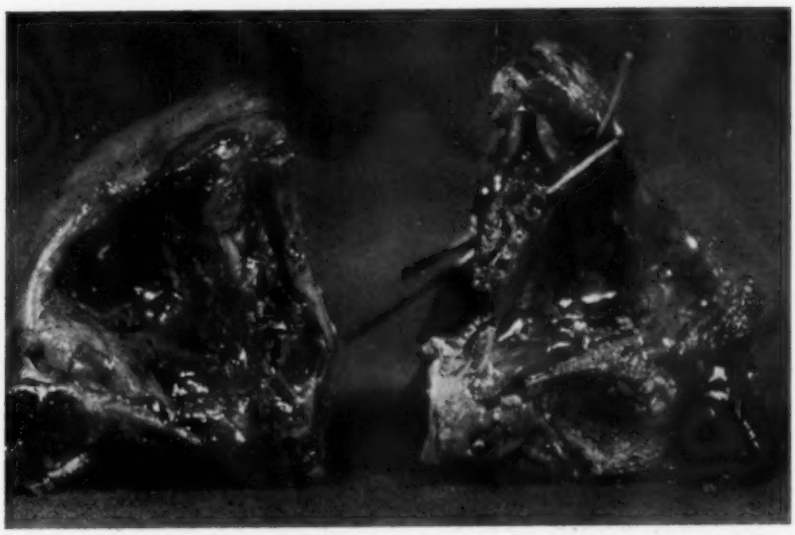

Fig. 11. Horizontal section through ethmoid region of right side of infant four days old. Broom straw shown in infundibulum and another in nasal duct. On left, towards roof of nose, olefactory slit and four well-developed ethmoidal cells, may be seen.

macroscopical. Repair is accomplished by the formation of scar tissue only and as scar tissue contracts, blood vessels become constricted and terminal atrophy supervenes. Obviously then the time to institute prophylactic treatment against catarrh of various types in the adult is in childhood.

EXTRACTS FROM LITERATURE ON ACCESSORY SINUS AND OTOLOGIC INVOLVEMENT

According to E. Frankel the accessory sinuses are diseased in 75 per cent of all cases of influenza. Prym and Bruck arrived at similar conclusions. These men were considering only the adult and mostly in epidemic infections. It shows, however, the frequency of involvement of the sinuses in bacterial invasions. Wertheim found that nearly every third tubercular body had an inflammatory affection of the accessory sinuses. This did not depend on the tubercular infection but on ordinary so-called congestion.

Lindenthals found that in influenza, the influenza bacillus appeared constantly in the sinuses. In diphtheria a pure diphtheria membrane has been definitely found by Weichselbaum.

Wolf found that in diphtheria of the upper air passages, the accessory sinuses nearly always participated.

E. Frankel viewed the diplococcus pneumonia as the chief cause of accessory sinusitis. He also says that in twenty-eight normal accessory sinuses he found the Frankel-Weichselbaum diplococcus of pneumonia most frequently, so

Fig. 12. Temporal bone at birth. Tympanic ring will be seen on surface and absence of an external osseous canal and mastoid process will be noted. (In normal position tympanic ring faces almost directly downward.)

it seemed that in pathologic conditions it was only a question of an increase in the number of bacteria existing in the sinuses under normal conditions that produced the disease.

Recent literature is replete with discussions of accessory-sinus disease in childhood, and of otological complications of nasal infections,

and as far back as 1684 DuVerney spoke on pus in the mastoid antrum of young infants; but considered this to have originated post

Fig. 13. Temporal bone in infant six months old, showing a beginning external osseous canal and mastoid operation done to demonstrate size of mastoid process at this age.

mortem. In 1921 Maurice Renaud found pus in the mastoid antrums of 70 infants dying of gastrointestinal disturbances.

Byfield and Floyd, working in conjunction with Dean of Iowa City, noted the frequent occurrence of mastoid infection in infants suffering from the symptoms mentioned.

Bernard Mahon states in a series of 39 cases of mastoiditis in infants occurring at St. Louis Children's Hospital from September 1926 to May 1927, that 56.4 per cent showed the symptom complex of increasing temperature, diarrhea, vomiting, loss of weight and athrepsia.

Clement F. Theisen in an article on "Ethmoiditis in Infants and Young Children," quotes Coakley as saying: "With chronic nasal discharge existing in young children with the absence of adenoids, the presence of sinus disease is fairly positive." The majority of cases of sinusitis in children under four years of age are ethmoidal involvement. He describes a case of acute ethmoiditis with orbital abscess and exophthalmos in a child six months of age.

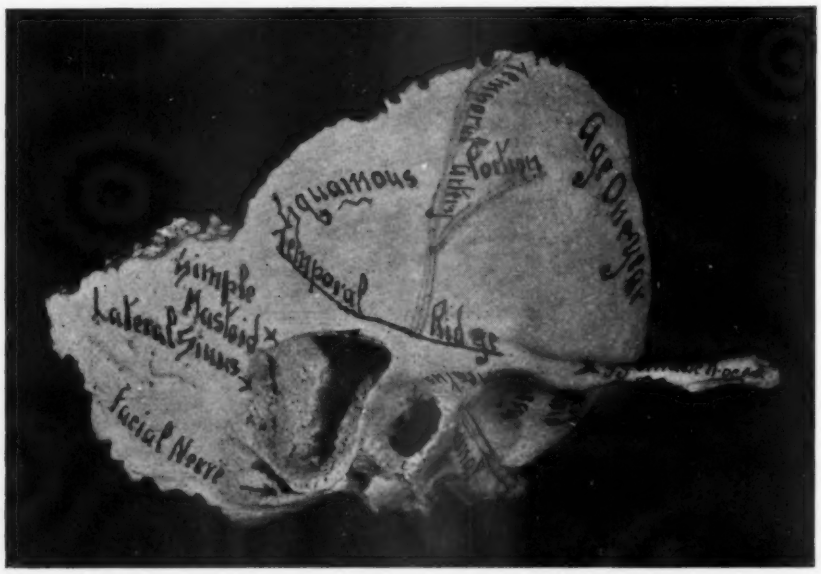

Fig. 14. Temporal bone of child one year of age, showing still further development of external osseous canal and mastoid process. Operation has likewise been done on this case.

J. J. Shea of Memphis, Tenn., in an article on the "*End-results of Sinus Surgery in Children,*" concludes:

but should enter actively into the discussion of the need of myringotomy or mastoidectomy.

5. Paranasal-sinus disease may cause all

Fig. 15. Temporal bone of child three years of age, showing development of external osseous canal and mastoid process in growing child. Mastoid operation was done in this case to demonstrate size of mastoid process at this age.

1. The end-results of sinus surgery in children has been satisfactory, the initial improvement being gratifying.

2. The majority of the sinus cases originate in the practice of the pediatrician and should be referred to a rhinologist for treatment.

3. The reabsorption of the discharge by the sinuses is dangerous and productive of constitutional diseases. The intention of the surgeon should be the production of continuous drainage and ventilation of the sinuses.

L. W. Dean of Iowa City, in an article on "*Acute Otitis in Infants,*" concludes:

1. The symptoms which lead to the discovery of otitis in infants are much more frequently pediatric than otologic.

2. The conditions which decide the choice of treatment in otitis are more often pediatric than otologic, refusal of food, dehydration, diarrhea and loss of weight may be the factors that will decide whether myringotomy should be performed. They may indicate mastoidectomy.

3. The otologist and the pediatrician should work in the closest cooperation and have complete confidence in each other.

4. The pediatrician should not confine his work to the general treatment of the child, the conditions enumerated in this article, except perhaps, syncopal death. In the presence of these conditions, a positive diagnosis of otitis should not be made unless an objective sign of the otitis exists.

6. If otitis is present, it can always be diagnosed.

7. Paranasal-sinus disease not unusually coexists with acute otitis. It is as a rule advisable to treat the patient for both. It is often difficult to decide which is the most influential in causing the systemic disturbance.

Mark L. Floyd of Iowa City, in an article on "Alimentary Intoxication," summarizes:

1. Certain infants, usually between the ages of eight weeks and eighteen months may suddenly develop symptoms suggesting a primary gastrointestinal disturbance resembling the alimentary intoxication described by Finklestein.

2. The symptoms are all marked, being lethargy, frequent and loose stools and dehydration, with great and rapid losses in weight in spite of symptomatic and supportive treatment. The bowel condition does not respond to diet rearrangement.

3. At necropsy, the only positive finding was pus in the mastoid.

4. Mastoiditis is masked, the symptoms being those of a severe gastrointestinal or nutritional disorder.

Fig. 16. Side view of skull of infant four months old on which line A-A1 has been drawn to show relationship of hard palate, and line B-B1 to represent floor of tympanic cavity. (This, taken in conjunction with shortness of Eustachian tube and low position of tubal orifice in infants will explain prevalence of otitis media in childhood.)

5. Bilateral mastoidectomy performed as soon as the condition is determined and other foci eliminated, has resulted in prompt recovery of many of these infants and is probably the only means of saving the child's life.

Denneth A. Phelps of Minneapolis, in an article on "*Cellulitis of the Orbit in Infants*," says: "the most frequent and usual cause of orbital cellulitis is often overlooked, and by experienced physicians. There are several important anatomic conditions of the sinuses and the orbit in children which favor and contribute to the development of orbital complications of sinusitis."

1. Regarding the bones, there may be congenital dehiscences along the ethmomaxillary suture, in the lamina papyracea, or in the orbital wall of the maxilla. The orbital bones are softer in children, ossification not being complete, and the sutures are ununited until the sixth year.

2. The orbital periosteum is thin and delicate: It not only lines the openings into the orbit, but forms one of the coverings of the nerves and blood vessels passing through them, thus becoming continuous with dura mater at the superior orbital fissure.

3. The sinus mucosa is in most intimate relation with the caseous tissue, so a slight inflammation of one produces a change in the other.

4. There is more profuse development of the lymphatic and vascular system than in the adult. Infection from the sinuses may enter the orbit along the veins without any bony perforation. Thus the infection in a child's nasal sinus has a much easier path to the orbit than it has in the adult. We are all aware of the frequency of subperiosteal abscesses of the mastoid in children and should realize that the same condition could occur in the orbit as a result of infection in the nasal sinuses.

Roy A. Barlow of Madison, Wis., in an article on "*Recognition of Sinus Disease in Children*," states: "The work of Dean and Byfield has stimulated investigation for the relief of sinusitis in children and has resulted in untold benefits for the children suffering from 'chronic colds' due to infection of the paranasal sinuses. Past histories have convinced me that many children have had

sinusitis and the correct diagnosis has been passed by, because of failure to recognize the condition.

Our attitude in regard to sinusitis in children is easily explained when we recall that it has never been impressed upon us that children possessed sinuses before they had reached the age of puberty. Even the most recent tests on sinusitis devote only five or six lines to the possibility of sinuses in children and add that the reported cases were really osteomyelitis and bone necrosis.

The antrum may be present in infants as young as six months and at twelve months or a little more it is quite well developed, as are also the ethmoids.

The maxillary sinus appears in the third month of fetal life as a small out-pouching from the lateral wall of the ethmoid infundibulum. The ethmoids arise from grooves and recesses in the lateral walls of the middle and superior nasal meati. The frontal sinus arises from an extension of the anterior and superior middle nasal meati.

Symptoms: The acute attacks are accompanied by the usual fever, general malaise, and so forth; usually within three or four days the sinus ruptures intranasally, the pain and general symptoms are relieved and only profuse nasal discharge remains.

Many cases of sinus disease in children are neglected or overlooked. All were overlooked years ago and it is not unreasonable to suggest that a neglected sinus infection in a child may be the etiologic factor in many cases of hay fever, nasal asthma and polyp formation in later life, to say nothing of its possibility as a focus of infection."

SUMMARY

Much more could be quoted, but space prevents. We may therefore conclude:

1. That there exists at birth all of the accessory sinuses more or less well developed, with the ethmoid group well developed and the mastoid structure in the form of a mastoid antrum. All of these structures communicate directly with adjacent cavities.

2. That when the principal cavities, namely the nasal passage and the middle ear, are infected, the accessory sinuses and the mastoid antrum are likewise infected.

3. That any one of these cavities may become a focus or infection, the symptoms of which are remote from the situation of the focus.

4. That the symptoms which are a result of the existence of these foci may be relieved only by the recognition of, and the removal of the focus.

5. As these foci frequently produce no symptoms referable to the focus they can only be excluded by a careful comprehensive examination of these parts.

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PRELIMINARY REPORT OF AN OPERATIVE PROCEDURE FOR GLAUCOMAS*

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NEW YORK

BECAUSE of the limited number (12) of cases in which this procedure has been used in its entirety and the limited length of time over which the results have been observed, it is necessary to call this a preliminary report and withhold any claims until a later date.

There is probably no ocular disease in which there is a greater diversity of opinion as to the correct choice of operation than glaucoma and many operators who use a certain operation for one type of glaucoma use an entirely different procedure for another type. Men who elect to do a comparatively simple iridectomy in one case, turn to the Elliot trephine, the Lagrange sclerectomy or cyclodialysis in cases where they would not expect the iridectomy to be sufficient. The purpose of the procedure presented in this paper is to secure a method which is applicable to practically all glaucomas, the degree to which it is carried to be determined by the purpose which the operator desires to accomplish. To arrive at the decision as to what end is to be attained, I take the liberty of making two simple classifications of glaucoma, namely, the type in which we may hope to reestablish normal drainage and the type in which, due to the permanent interruption of the normal drainage system, we must create an artificial drainage by means of a cystoid scar. It is understood and acknowledged that in some complicated glaucomas, such as hemor-

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rhagic glaucoma, a posterior sclerotomy is safer and advisable.

The first part of the operation is the

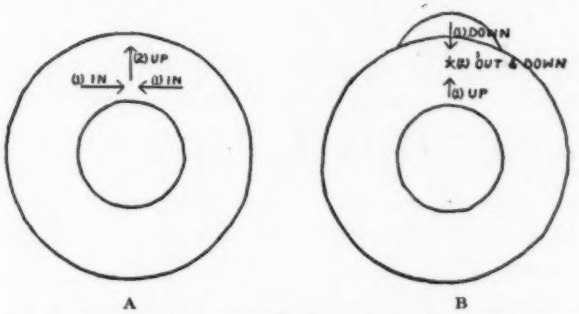

Fig. 1. Schematic representation of traction. A. Present technique. B. New technique. (1) Direction in application of forceps. (2) Direction of traction in delivery of iris.

iridectomy with the dissection of the "iritic" root after the manner described by Török[1] and I report this verbatim with the permission of the author. The second part of the operation consists of a sclerectomy by means of a slightly modified Vacher-Stephenson scleral punch.

Iridectomy is still the classical operation for glaucoma and is the one which is performed in preference to other procedures in all cases where its performance promises success.

There are many theories advanced to explain the mode of action of iridectomy. Most of these are only of historical interest and therefore not enumerated in this paper. The one which is generally accepted is based upon the theory that the maintenance of normal intraocular pressure is accomplished by the aqueous being drained off through the spaces of Fontana by the Schlemm canal, thus having a continuous flow. Pathological examinations of glaucomatous eyes show that the spaces of Fontana in glaucoma are obstructed so that the aqueous cannot be drained. This obstruction may be due to the root of the iris being pressed against the posterior surface of the cornea without being adherent to it, or the root of the iris may be solidly glued to the posterior surface of the cornea by organized plastic exudate. This organized plastic exudate may also entirely fill and obliterate Schlemm's canal.

Now pathological examinations of glaucomatous eyes, where iridectomy was successfully performed, but which were enucleated for some other reason, have shown that the reduction of tension was obtained either by the opening of the passage at the iritic angle

Fig. 2. Detaching adherent root of iris.

for the exit of the fluid or by the formation of a new channel by means of a cystoid scar. Therefore a successful operation for glaucoma must either reestablish the natural channel of drainage or form a new permanent channel. This according to Elschnig can be obtained by either detaching the root of the iris from the periphery of the cornea or incising it, thereby producing a direct communication between aqueous and Schlemm's canal. The opening between anterior chamber and Schlemm's canal must be large so that a sufficient quantity of aqueous may be drained off through it to maintain normal intraocular pressure. The reestablishing of this communication can be obtained by a large peripheric iridectomy, by means of which the root of the iris is detached from the cornea and then excised so that it cannot reattach itself again.

This is the universally accepted theory nowadays as to the mode of action of iridectomy in glaucoma. It is self-evident therefore that iridectomy in glaucoma will not be successful if the root of the iris is not detached by reason of faulty technique. These are the cases where a second properly performed iridectomy reduces the tension permanently. It also will be unsuccessful when the root of the iris cannot be detached owing to too firm adhesions. These are the cases where although the iridectomy was performed correctly according to our present technique, the iris tears off anteriorly to the adhesion so that its root remains behind and the iris angle stays

[1] Török. *Arch. Ophthalmol.*, 52: No. 6, 1923.

obstructed. Finally iridectomy will be a failure even though the root of the iris is detached and excised when Schlemm's canal is obstructed by

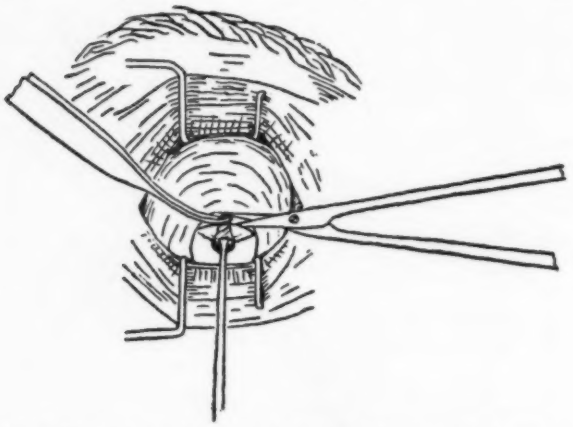

Fig. 3. Excision of iris, showing application of forceps, delivery of iris and position of scissors.

organized plastic exudate thereby losing its patency.

These latter cases are usually met with in patients suffering from chronic inflammatory glaucoma of long duration especially if they have had one or more acute attacks. Iridectomy is not in order in these cases, but one of the operations which establishes a new channel of drainage such as the Lagrange operation or the trephining.

Now, there is no doubt in my mind that iridectomy is a safer operation than either Lagrange's or Elliot's and therefore preferable to either one. Suffice to mention iridocyclitis and late infections, and I believe that with the exception of the last group mentioned above where Schlemm's canal is not patent, iridectomy, if we succeed in detaching the root of the iris and excising it, will produce a permanent drainage of the intraocular fluid . . .

An iridectomy on a glaucomatous eye will be performed as follows:

The eyeball is fixed in the limbus at either end of the horizontal meridian of the cornea with a double fixation forceps such as Schweigger's or one similar to it. This will greatly facilitate the section as it will eliminate the rotation of the eyeball, a complication which is most disturbing. The incision is made above, puncture and counter puncture being in the sclera, and the section terminating behind the limbus with a conjunctival flap. It is similar to the one made in Lagrange's operation but not carried quite as obliquely through the sclera, the cutting edge of the knife having been turned forward when the corneoscleral junction

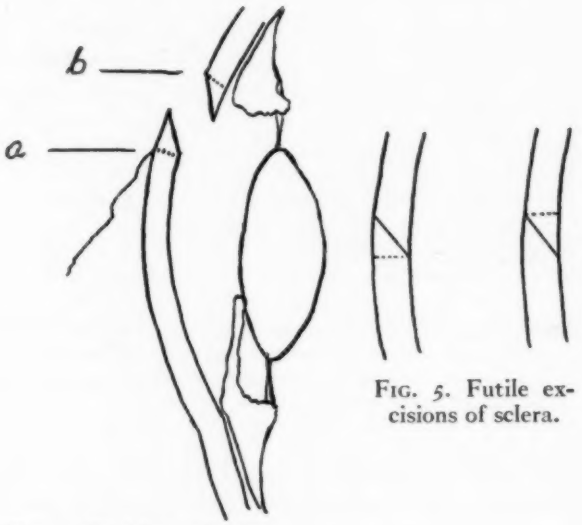

Fig. 4. Excisions of sclera.

Fig. 5. Futile excisions of sclera.

(2 mm. behind the limbus) is reached. The conjunctival flap is now grasped with an anatomical forceps and gently pulled forward making the wound gape thereby. With an iris spatula, holding it always in close contact with the sclera, the root of the iris is detached throughout the whole extent of the wound and if one wishes the spatula can easily be pushed still further forward between ciliary body and sclera as far as the suprachoroidal space. The ciliary body is thereby detached and a cyclodialysis from the anterior chamber performed. If one always keeps the spatula in close contact with the sclera, there is no danger of injuring the ciliary body or losing vitreous.

The assistant now takes the anatomical forceps and keeps the wound gaping by means of traction on the conjunctival flap and the surgeon grasps the iris with the iris forceps. This is done by introducing the forceps parallel with the wound, one blade being placed near the root of the iris, the other one a few millimeters below. The forceps is now closed and the iris drawn out, gentle traction being exerted forward and slightly downward toward the patient's feet and excised with two sweeps of the scissors. The scissors are held parallel with the wound and placed upon its posterior lip by holding them slightly tilted so that one blade is actually in the anterior chamber. The pillars of the coloboma are now replaced

if necessary, the conjunctival flap smoothed out and a bandage applied.

If the operator's object is the restoration of the normal drainage system, the operation is now complete. If however, our objective is the formation of a cystoid scar, we proceed from this point as follows:

The conjunctival flap is separated from the sclera by blunt dissection with scissors and if the failure to make the incision far enough back into scleral tissue causes the scleral shelf of the lower edge of the wound to be too short, a slight separation between the layers of the cornea is made by a continuation of the same use of the scissors.

Maintaining traction upon the conjunctival flap with thumb forceps to prevent possible button-holing of the flap, the solid blade of the 3 mm. scleral punch is introduced below the lower shelf and, closing the hollow blade upon it from above, a button is excised represented by the dotted line (a) in Figure 4. The punch is now reversed with the solid blade again within the eye and applied to an opposing position on the upper shelf, which is already cleared of iris structure below and conjunctival structure above, the blades closed and an adjoining button of sclera excised from the upper shelf represented by the dotted line (b) in Figure 4. The removal of these two buttons precludes the possibility of merely removing one thin edge and thus failing to create a patent drainage opening between the two lips of the wound as would be the case in Figure 5.

Assuring ourselves that the iritic pillars are free from the incision, the conjunctival flap is replaced. It may be secured with a stitch though to me it seems unnecessary and because of the increased possibility of infection, unwise. The usual after-toilet is made and the eye dressed and bandaged.

Daily dressings are done after the first forty-eight hours and the patient allowed to leave the hospital on the eighth day.

CHRONIC APPENDICITIS—WHAT IS IT?*

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THERE are two reasons why most medical discussions are not worth the time spent on them. The first is that the discussers seldom adhere to the topic. The second, and more important, is that there is such poor definition of most medical terms that no two people are talking about the same thing.

If a group of physicians is gathered together, there is no topic that can be brought up that is more certain to produce a heated argument than "chronic appendicitis." Opinions of the curability of this condition vary from 100 per cent on the part of certain enthusiasts to a 30 per cent estimate from sceptics. The reason for this discrepancy in figures is that the two groups are probably talking about different things.

The term "chronic appendicitis" means one thing to the clinician, another to the surgeon, a third to the roentgenologist and still a fourth to the pathologist. Hence, it is quite obvious that these four can never be brought to any unanimity of opinion until a common ground for discussion is arrived at.

I propose that the term "chronic appendicitis" as a final diagnosis should be junked as inadequate. The same applies to chronic cholecystitis and salpingitis, as the nomenclature of these conditions is in the same befuddled state.

* From the Surgical Department of the Fifth Avenue Hospital, N. Y. Submitted for publication April 20, 1929.

The word "chronic" is derived from the Greek and means relating to time. The suffix "itis" means inflammation of. Now, the final opinion as to the degree of any inflammatory process is, at the present time, in the hands of the microscopist, and when an organ, such as the appendix, is sectioned and stutied under the microscope, I cannot see why the pathologist has a basis for any statement as to the length of time that the inflammatory process has been going on. If we use the term "chronic" to apply solely to the length of time that the symptoms have been present, we are using it in its correct sense, but when we try to use it to modify the degree of inflammatory reaction, it doesn't make any sense. Hence we will never get anywhere until we divorce the two words in the final diagnosis, if we are to base that final diagnosis solely on microscopy.

This confusion of terms has led to the ridiculous situation in which the pathologist returns a diagnosis of "chronic appendicitis" when he does not see any evidence of what he understands as "chronic appendicitis," in order that the records may not disagree. But he does this in a condescending mood, the while believing that surgeons are a group of avaricious dolts who remove an appendix for no very tangible reason unless it be the money collected therefrom. This situation is hardly scientific, and leads to the grouping under one head of a series of cases which are widely divergent in their characteristics.

It is my firm belief that it is perfectly possible for an appendix to produce symptoms which justify its removal and yet not show any evidence recognizable by the majority of pathologists of being involved in any pathological processes. I base this statement on my belief that we have not yet learned to identify the morphology of very early inflammatory disease. Just as we have a great deal to learn about cytology, so have we a great deal to learn about the microscopy of early inflammatory disease. If any one has any doubt about the progress which can be made in cytology, all he has to do is to look at the living leucocyte by the supravital staining method and then see the same cell after it has been dried, fixed, and stained for the usual differential blood count. That "living tissue study" would reveal similar differences cannot be doubted.

Under the existing terminology, if a surgeon chooses to remove an appendix, he must apply to it one of three diagnoses:

1. Acute appendicitis.
2. Subacute appendicitis.
3. Chronic appendicitis.

I have no quarrel with the first of these three terms, but I claim that the other two, in the last analysis, mean nothing.

We are at present engaged in a study of intra-abdominal inflammatory disease. After reviewing some sixty cases of appendicitis operated upon by different surgeons, I was at once struck with the impossibility of drawing any deductions from them because none of the descriptions of the gross pathology was based on the use of common terms. What one operator calls one thing, another calls a second and a third a third. Most of the operators used the term "chronically inflamed" to describe any pathological state other than the acute.

If we are to make progress in the study of this vital problem, we must have uniformity in describing the condition of things immediately before the operation, during it, and the results of the laboratory studies which ensue therefrom. To this end, we are offering a guide for surgeons to follow in describing (1) their reasons for performing the operation; (2) what they find after the abdomen is opened; and (3) the correlation of the first two and the laboratory data.

There are only five reasons for a surgeon to remove an appendix:

1. He believes the appendix is undergoing an inflammatory reaction which, if uninterrupted, will probably result in general peritonitis and death. To this

condition we have applied the term, "symptoms active and progressing."

2. He believes that the appendix is involved in an inflammatory process, but does not believe that the symptoms are growing progressively more severe.

3. After a review of the history, he believes that the patient has had one or more attacks of acute appendicitis, but the organ is not in such a condition that if he were to let it alone, it would immediately go on to abscess formation, perforation, etc. The patient probably has some type of gastrointestinal fault, which for want of a better term we call indigestion. Deep pressure in the right lower quadrant elicits some rigidity in the right rectus and some pain. To this condition we have applied the term "symptoms dormant."

4. Because the surgeon has the abdomen open for some other purpose and because the appendix is readily available, for prophylactic reasons he believes it best to remove it. This reason we have termed "prophylaxis."

5. A gastrointestinal series has revealed the fact that the appendix does not empty readily or there is some deformity of the cecum which may or may not be accompanied by signs of irritability of the pylorus. This patient was suffering from our old friend "chronic" indigestion. From a study of many cases we have learned that, if the appendix is removed and if it was causing the gastrointestinal delay, the patient will be cured. As a reason for removing such an appendix we give "radiological evidence."

It seems to me that our greatest fault lies in the fact that we are much too prone to jump to conclusions instead of being satisfied with an accurate description of exactly what we can see and feel. When the abdomen has been opened and conditions in and around the appendix can be inspected and palpated, the surgeon is in a position to make certain definite statements. This, I believe, is as far as he should go. He should not try to sum up the entire situation by some such statement as "the appendix appears to be chronically inflamed." We see certain pathological conditions and rather than study them as they exist, we stick a name on them which implies deductions which we are in no position to substantiate.

One of the simplest observations which a surgeon can make is the anatomy of the appendix. The little space in the lower left-hand corner of the chart (Fig. 1) gives him the chance to draw in the anatomy provided he has had the opportunity of seeing it or feeling it before its position has been changed, due to operative procedures.

Inspection of the appendix usually permits the surgeon to state what kind of pathological process is involving it. The most usual is inflammatory process.

Now, in order to be as lucid as possible, let us discuss the more obvious degrees of inflammatory reaction first. Going on the assumption that the inflammatory process progresses from edema, swelling and redness to the formation on the serosa of a plastic exudate, thence to abscess formation and finally gangrene, in other words that gangrene is the most severe degree of inflammatory process, I have listed the degrees of inflammatory reaction in this order.

If an appendix is gangrenous, it is readily apparent that it is so. The only description that is necessary is the extent of the gangrene in relation to the organ. If an appendix is involved in an abscess, that, too, is readily apparent. Here all we need do is to state in what part of the organ the abscess occurs and how much of it is involved. If the appendix is covered by a plastic exudate, this also is readily apparent and calls only for a description of the distribution of the exudate, that is, whether it covers the entire organ or, if not, what portion of it.

Now between the time when the appendix is covered with a plastic exudate and the time of the onset of the inflammatory process comes the stage of which, I believe, we know so very little, unless evidences of

the inflammatory reaction be quite gross. This I have called "first-degree inflammatory reaction" for want of a better term.

Fig. 1.

There are certain observations about it which we can make.

1. As regards the color of the organ and the distribution of that color. Is it pale? Is it red? If it is red, is that redness distributed evenly over the organ, or what portions are involved? (I do not know of a better term to apply to the color of a normal appendix than "pale." Perhaps the term "normal intestinal color" might be better.)

2. What is the consistency of the walls of the appendix? Is it thin and pliable, as we might expect a normal appendix to be (to which we have applied the term "flaccid")? Or is there a thickening of these walls? If so, does that thickening extend over the entire organ, or involve only a portion of it?

It is obvious that this latter observation can be made only after direct palpation of the entire organ, which would, of course, be inadvisable if the operator believed that by so doing he would be contaminating portions of the peritoneum which had hitherto been uninvolved. Under such conditions this observation can be made after the organ has been removed and the surgeon has finished his operation.

Another type of pathological process in which we find the appendix involved is to my mind best called "mechanical." In this there is some deformity of contour, such as kinks, twists or bends, or there is some deformity of blood supply, or there is some deformity of the lumen and wall as exemplified by the fact that the caliber of the organ varies markedly at different sites. There may be a hard body within the lumen which we cannot readily milk up into the lumen of the cecum, showing that a constriction has occurred proximal to what is equivalent to a foreign body even

if it be a collection to inspissated fecal material.

A normal appendix varies so in length and thickness that I do not believe that any special attempt should be made to give its dimensions. A short, almost rudimentary appendix may cause as much trouble as one which is 3 to 4 inches in length.

The appendix may be the site of a neoplasm. If this type of pathology is present a description of the distribution of the neoplasm and the presence or absence of involvement of the adjacent lymph nodes is called for.

And lastly, we have that condition in which the appendix itself does not give evidence of any pathology, but on examination, the mesoappendicial nodes will be found enlarged and hard. If so, how many of them are so involved and what is their distribution and if one can be removed from examination, what does biopsy show?

Now, having dealt with the pathology which involves only the appendix, the next observation which we can make with moderate certainty is whether some other organ is adherent to the appendix by what appears to be fresh adhesions. This other organ may be the omentum, ileum, possibly the cecum or ascending colon itself, or one of the organs in the pelvis.

Another observation of the same type which may or may not be important is whether the tip or a portion of the body is adherent to the parietal peritoneum deep in the pelvis. If this be true, it is not always possible for the surgeon to state whether these adhesions were young or old, but his impression is of vital interest.

Another observation which can be made with certainty is: when the peritoneal cavity was first opened, was there readily apparent peritoneal fluid immediately under the incision. I admit that probably all peritoneal cavities at all times contain some fluid, but what is of interest here is whether there was enough present to be readily apparent to the operator when the incision into the peritoneal cavity was made. If so, did it resemble serum in that it was clear and straw color, or was it of the consistency and appearance of milk or cream? Or did it appear to be blood or blood tinged? When the peritoneal cavity was opened, was there gas present, or did the peritoneal fluid have no odor?

Now, during the course of our operation, certain laboratory procedures should be carried out.

1. A culture should be taken of our knife blade. If a detachable type is used, the blade may be detached and dropped into a tube of bouillion.

2. As soon as the peritoneal cavity is opened and before any instruments, sponges or fingers are introduced, a culture should be taken either by swab or pipette. If demonstrable fluid is present a loopful should be taken and two smears made, one for Gram stain and the other for supravital stain.

3. As soon as the appendix has been brought into view a culture and smears should be taken from the serosa of the organ.

4. Before the appendix is removed cultures may be taken from the right lumbar gutter and probably from the cul-de-sac, as well as smears.

Another piece of laboratory data which should be available at the conclusion of the case is whether the lumen of the appendix contained parasites or not.

There is nothing to be gained by correlating the findings of different operators if these men have not agreed upon a common terminology. Statistics as to the results obtained from removing appendices for various reasons must necessarily be based upon the work of more than one surgeon. Hence the foregoing set of specifications is offered as the minimum observations which must be made in each case. I believe that if 1000 cases, each one having been detailed according to the foregoing plan, were to be reviewed and checked against an adequate follow-up examination much could be accomplished in clarifying the chaos which at present exists in regard to the desirability of operating upon

patients suffering from pathological conditions affecting the appendix.

In the long run we must correlate our gross pathological findings with the results of microscopic study of the diseased organ. The custom which exists at present to take a cross section through the tubular organ is, I believe, inadequate. It is not more logical to suppose that we can judge the pathological processes affecting the appendix by studying a cross section of it which is 1 micron in thickness than to suppose that we could judge the pathology of the entire gastrointestinal tract by studying any section of it 1 inch in length. We must learn where the normal anatomy has become distorted, what the various processes are, which are going on at the periphery and at what point the maximum pathology exists.

Lewis Gregory Cole in his recent studies of peptic ulcer and carcinoma has most clearly demonstrated the fallacy of the study of small sections and it is to the inspiration afforded by his clear thinking that the present investigation is undertaken. Sections of the gall bladder, appendix or tubes or any other organ in the abdomen undergoing inflammatory processes should be made parallel to the long axis of that organ and should include its entire length. Except by the use of celloidin sections this procedure is at present almost impossible. Methods must be developed for the cutting of large sections, thin enough to permit of their adequate microscopic study. And these sections must be cut before the organ has been grossly distorted by being immersed for comparatively long periods of time in preservative fluids.

I believe that it is only when the gross pathological data, as suggested in the foregoing outline, are compared with the microscopy of longitudinal sections and the bacteriology of the peritoneal cavity at the time of operation that we will make any progress in our study of intraperitoneal disease.

Dr. Sabin of the Rockefeller Foundation has added immensely to our knowledge of the life and functions of the white blood cells. This she has done by perfecting the technique for the study of these cells in vivo and some such similar method must be applied to the study of the cells which are in the peritoneal fluids if we are to learn the functions of these fluids.

As to the bacteriology, there are so many instances in which the clinical picture clearly indicates the presence of inflammatory processes, while any attempt to grow bacteria is futile according to our present methods of culturing, that I believe we must acknowledge that our methods are at fault and not draw the usual conclusions that bacteria are not present. Our failure to identify these organisms is only an example of our ignorance and not any indication that the bacteria are not present.

If three or four men of wide experience compare the results of their operations, classified according to the suggested scheme and not lumped under the grossly overworked and entirely inadequate term "chronic appendicitis," progress will be made in our study of intra-abdominal inflammatory disease, and not until then.

SUMMARY

To sum up, let us stop using the term "chronic appendicitis" as a final diagnosis. If we do not wish to burden the patient's memory with a long string of, to him, incomprehensible observations, let us at least be scientific enough not to use indefinable terms amongst ourselves.

An outline has been suggested which may aid materially in our study of the gross pathology of intra-abdominal inflammatory disease.

It has been suggested that sections of the appendix, or any organ, should be made in such a manner as to permit of the study of the wall of that organ in its entirety.

New methods must be developed for the identification of intraperitoneal bacteria.

THE RELATION BETWEEN TONSILLITIS & APPENDICITIS*

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H. S., female, was admitted to the Medical Service of the Fifth Avenue Hospital, January 9, 1928 for observation. On admission the patient had a sore throat, a chronic infection of both tonsils, a painful cicatrix of the plantar fascia, a negative abdomen, and some indication of an artificial menopause. An operation on her foot and a tonsillectomy were advised. The foot operation was done January 21, 1929. The following day the patient suffered nausea, which continued throughout the 22nd, 24th and 25th, at which time a basal metabolism was done, showing 25 below normal. Lack of appetite increased, pain developed in the epigastrium, tenderness developed over the right lower quadrant of the abdomen and a roentgenogram on January 31 was reported as revealing a chronic appendicitis. On February 1 the appendix was removed and the condition subsequently diagnosed by the pathological laboratory as subacute. Recovery was normal. On February 10 the tonsils were removed.

The question of possible relationship between the sore throat, the chronic tonsillitis, and the inflamed appendix seemed worthy of consideration. With this in mind a review of the literature was made of which a bibliography is attached.

A great many observations have been made from time to time and well summarized by H. B. Anderson of the University of Toronto. The following extracts are worthy of thought:

It is highly probable that tonsils are often factors in many systemic disorders where a direct bacterial connection may not be demonstrated; a relationship which has been noted since A.D. 10 when Celcus first removed tonsils. It has not been definitely settled whether the bacterial products are distributed by way of the vascular or lymph channels, or by the bowel. Quite probably each of these avenues should be considered in dissemination. The etiology of appendicitis is varied, the colon bacillus, various pathogenic microorganisms that reach the appendix, worms and their ova may cause appendicitis. An apparent relationship exists between preceding disease of the respiratory tract and a following appendicitis.

As a result of investigation, numerous bacteria, pathogenic and otherwise, have been isolated from tonsillar and peritonsillar tissue, e.g. pneumococci, various strains of staphylococci and streptococci, bacillus coli communis, etc. Based upon these bacteriological findings, the tonsils have been held responsible for the production of chronic arthritis, endocarditis, and pericarditis, chorea, acute and chronic nephritis, peritonitis, cervical adenitis chronic toxemias, neuritis, osteomyelitis, acute and chronic aural lesions and appendicitis.

The relation between acute rheumatism and appendicitis has frequently been noted, and when one recalls how often tonsillitis precedes the former, the etiological connection of tonsillitis with appendicitis is more readily apparent.

To Sir James Grant of Ottowa is due the credit of reporting, in 1893, the first modern instance of the association of appendicitis and rheumatism. The same year, Kelyonack directed attention to the occurrence of appendicitis secondary to tonsillitis. In Europe, the association of the two diseases has been more systematically studied from both the experimental and clinical standpoints, and consequently more generally recognized by the medical profession as a whole. The similarity in structure between the tonsils and the appendix has frequently been pointed out and given as an explanation of their liability to similar infection.

* From the Surgical Department, Fifth Avenue Hospital, N. Y. Submitted for publication April 20, 1929.

Adrian in 1901, succeeded in producing appendicitis in rabbits by intravenous injection of staphylococci, streptococci, pneumococci, B. typhosus, B. coli, B. anthracis and the tubercle bacillus. He regards the appendix as a point of election for the localization of general infection.

Subsequently Tedesco investigated experimentally the significance of tonsil infection using streptococcus, staphylococcus and B. anthracis. He concluded that pyogenic germs from the pharyngeal ring can, in rabbits, lead to embolic processes in the parenchyma of the appendix and that it is therefore possible for hematogenous infection to produce characteristic follicular disease of the appendix.

Mori concludes that appendicitis may originate by way of the blood channels. Kertz believes that almost every case of appendicitis is in causal connection with angina, through hematogenous infection. The conclusions of these authorities have been called in question by Ghon and Namba, as the result of their experiments, as well as by Aschoff, Ogino and others.

Schroetter thinks that an etiological connection between angina and appendicitis has been established, and that this is confirmed by the prevalence of appendicitis a few weeks after changeable seasons, when angina and throat trouble are especially common. Kelly, in reporting cases from Johns Hopkins Hospital, recognized a definite relationship.

Poynton and Paine believe they have furnished almost conclusive proof that appendicitis may result from streptococcal invasion through the blood stream, from a follicular tonsillitis.

Ogmo thinks there is no doubt that hematogenous infection does occur in some cases but less frequently than Kretz maintained. Bort and Heyde express a similar opinion. Heile does not deny the possibility of hematogenous infection, but it seems to him more natural and simple to assume that this infective agent reaches the appendix and peritoneum from the intestines.

Haeberlin thinks there is no doubt that hematogenous infection occurs after angina and scarlet fever but that the number of cases in which it plays a rôle is very limited.

Tedesco says he has produced embolism and necrosis of the appendicular follicles experimentally in rabbits. He further states that if appendicitis is immediately preceded by a tonsillitis, rapid necrosis of a follicle in the appendix with perforation or gangrene is to be anticipated; therefore operation should be performed early. Others have referred to the tendency which these cases have to develop extremely acute symptoms following tonsil infection.

Few textbooks mention any association between appendicitis and tonsillitis. Brenneman, in 1927, found it mentioned in only one out of twenty-two leading books.

Freer reports a simultaneous occurrence of tonsillitis with appendicitis in 7.5 per cent of his cases, Richter in 4.06 per cent of 172 cases.

Appendicitis may occur in greatly increased number during epidemics of grippal infection, as substantiated by Freer, Haushatter, Richter, Gioseffi, Evans, Hood, Mantle, Martin, Marrel and others.

The most interesting recent data is by Evans, of the University Clinic of Madison, Wisconsin, reported by Brenneman in 1927. He bases his report on the incidence of appendicitis, and of pyogenic infection of the upper respiratory tract, among 16,000 students at the University of Wisconsin.

During the period of six and one-third years, there were 236 cases of appendicitis, an average of 4 per school month. There were 113 cases of appendicitis in 226 epidemic days, as compared with 113 cases in about 1600 non-epidemic days, or about 8 times as many. He states that 86 per cent of the total number of cases of appendicitis showed an upper respiratory tract infection. He claims that the attack of appendicitis is apt to occur on an average of sixteen days after the throat attack. He reasons, and cites Billings and Rosenow to support his view, that metastasis from such pyogenic foci takes place when the organisms have lost a certain degree of virulence, due to the focalizing processes at the original point of entrance; but whether the infection reaches the appendix by the blood stream, lymph stream or by the intestine, is not as yet settled. All may be possible. It does however appear to reach the appendix lymph glands and finds a receptive soil in a very similar lymphoid tissue.

From the work of these men, it is obvious that the evidence concerning a pathological relationship between appendicitis and

upper respiratory tract infection varies so greatly that unexceptionable conclusions as to relative frequency and relative importance of such a relationship cannot as yet be made. That such a relationship exists frequently enough is more than probable.

It must be borne in mind that these acute infections play an important rôle in the general mechanism of lowered resistance as well as serving as a primary source of infection in appendicitis. It is probable that the localization in the appendix is not only due to the development of a selective strain of the microorganism but that the primary infection is also one of the important factors in the lowered resistance of the appendical region as an expression of general lowered resistance.

An analysis by the author was made of the 113 operations for appendicitis performed during 1928, on the Staff Service of Dr. Frederic W. Bancroft, at the Fifth Avenue Hospital, New York City. In 95 cases, definite data were recorded as to the condition of the throat on admission and as to the presence or absence of the tonsils. Twenty-eight cases had no specific data, 13 of these being designated as "acute throats," 7 as "negative" and 8 no data. Many omissions were due to the emergency of the particular case and a few to the negligence of the interne. Only those cases with complete data are considered in the following analysis.

The analysis of the 95 complete cases is as follows (the final diagnosis was in all cases taken from the laboratory report):

ANALYSIS OF 95 CASES OF APPENDICITIS

Throat Condition	Per Cent of Cases
Tonsils present	76
Tonsils removed	24
Acute throat on admission	46
Negative throat on admission	54

THE 95 CASES WERE SUBDIVIDED AS FOLLOWS

Type of Appendicitis	Per Cent
Chronic	63
Subacute	6¼
Acute	21
Acute Suppurative	5¼
Gangrenous	4½

ANALYSIS OF THE SUBDIVISIONS

	Chronic	Subacute	Acute	Acute Suppurative	Gangrenous
No cases	60	6	5	20	4
Tonsils present, per cent	71⅓	66⅔	100	80	100
Tonsils removed, per cent	28¼	33½	0	20	0
Acute throat on admission, per cent	41½	33⅓	20	65	100
Negative throat on admission, per cent	59	66⅔	80	35	0

An analysis of the 34 cases of acute and chronic tonsillitis and peritonsillar abscesses admitted during 1928, not including " hypertrophiedadenoids and tonsils" admitted for operation is as follows:

	Cases	Tenderness R.L.Q.
Chronic tonsillitis	10	1
Acute tonsillitis	16	4
Peritonsillar abscesses	8	0

Fourteen and one-half per cent showed tenderness in the right lower quadrant.

While no definite conclusions can be drawn from so small a number of cases it is interesting to note that in the total number of cases, 95, 76 per cent had not had the tonsils removed; 24 per cent had previously had a tonsillectomy. Forty-six per cent were admitted with an acute inflammatory condition of the tonsils and pharynx. The acute and gangrenous appendicitis cases all had tonsils present and all the gangrenous cases had an acute sore throat on admission.

The more dangerous form of appendicitis did occur in the cases in which the tonsils were present and which had a sore throat on admission. The greater the percentage of tonsillectomy the less severe the involvement, the subacute and the chronic cases not being far apart in this respect. The impression frequently held that tonsillectomy predisposes one to an appendectomy

is not apparent from this analysis but quite the reverse may be true. A continued observation of a greater number of cases would be instructive.

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A REPORT OF THE OBSTETRICAL ANESTHESIA ON THE STAFF SERVICE FOR 1928*

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OBSTETRICAL anesthesia evidently preceded all other medical or surgical procedure, if one is to believe the Holy Bible, for during that first obstetrical case it is reported that Adam was "cast into a deep sleep."

Our present obstetrical anesthesia service this past year has served 211 staff patients from December 27, 1927 to December 4, 1928. We have had fewer cases on the staff service than the average, which has been about 250 a year.

This service was rendered by 17 persons, the internes on the rotating service having from 1 to 29 cases each and averaging 19 per man. These internes come to our service having been trained and approved by the Surgical Anesthesia Staff, so we have not had novices. However, in this regard it should be noted that obstetrical anesthesia is a special branch of anesthesia and for best results a thorough cooperation of the obstetrician and anesthetist is essential. Often by special care and with equipment such as is available in this institution, birth injuries to the mother can be avoided or lessened.

In this connection, let us consider the total time spent this year on staff cases of a total time of anesthesia given the 191 cases of ninety-six hours and seventeen minutes, in surgical repair alone, we have consumed a total of thirty-two hours and forty-five minutes and we find that in giving some degree of relief for the obstetrical part of the case we have used a period of sixty-three hours and thirty-two minutes. This is a great improvement over the days of not so long ago when the delivery and repair were both done with no anesthetic. We use the Gwathmey gas-oxygen-ether machine, or open mask only.

How much more relief can we give? In 136 cases in this series in which we have a record of the time from the beginning of second-stage labor to the first anesthetic there were 268 hours and twenty minutes during which labor pains were not relieved. In the remainder of the cases relief of some type was afforded by the use of morphine, allonal, rectal anesthesia or codeine.

The statement is often heard that certain "types" or nationalities require more or less special attention to physical or mental pain than the average person. At Fifth Avenue Hospital this year, 87 patients received medications to act as adjuvants to the general anesthesia. They received 105 medications, 1 to 4 per person. These were distributed to 56 primiparas and 31 multiparas. Those requiring medication were: Jews 27, Irish 9, Porto Rican 2, British West Indian 2, Syrian 1. Our total cases by religion were: Jews 60, Protestant, Catholic, or religion not stated 172; by nationality; United States 95, Ireland 24, Turkey 16, Greece 11, Italy 10, England, Porto Rico and Russia 6, Austria and Scotland 4, British West Indies and France 3, Germany, Hungary, Roumania and Syria 2, and 1 each from Argentine, Canada, Denmark, Poland, South America, Spain and Switzerland.

Of these patients 103 were given intermittent and 51 continuous anesthesia. This consisted of ether 5, gas 25, gas-ether 27, gas-oxygen 68, gas-oxygen-ether 63, ethylene 2, chloroform 11, and none 14. Rectal anesthesia was given 4 times but was supplemented with general anesthesia in each instance. No local or spinal anesthesia was attempted. Ethylene was not used by the interne staff owing to present

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regulations and the present status of this agent.

For all the anesthesias given the shortest, from beginning to delivery, was one minute; one hour and thirty-seven minutes the longest. The average of all cases was seventeen minutes. This was divided into primiparas, average thirty-four minutes, and multiparas, average twelve minutes. Patients receiving no anesthetic were 2 primiparas and 12 multiparas. The primiparas were (1) a premature breech extraction of a 5 lb. infant, and (2) a premature stillbirth. The remainder were apparently precipitate. This brings up the point that in general this service has been very prompt in getting to the delivery room, the average time that these patients have waited for the beginning of the anesthetic is nine minutes.

In attempting this study, these points were kept in mind: (1) that all statistics can be made to fit the argument. These cases except in 2 instances were not prepared by me but only the tabulation and apparent conclusions drawn from them. Here due credit should be given those who maintain the record system of the Fifth Avenue Hospital. They are not perfect, in fact in a few rare cases they are very faulty, but the average for the 217 charts submitted and here worked up was complete and satisfactory.

The plan undertaken here was to prove by the records the facts concerning (1) a belief common among many obstetricians and obstetrical practitioners that it is not safe to the infant to give morphine in any amount to the mother any time less than six hours before delivery; (2) that oxygen with some other agent is a principal factor in causing excessive bleeding; (3) that Jewish patients require more anesthesia or analgesia than other persons, and (4) that obstetrical anesthesia can be brought to a point of much greater service to the obstetrician and the patient.

1. At The Fifth Avenue Hospital, we gave 87 patients morphine sulphate with or without magnesium sulphate in doses from $\frac{1}{8}$ to $\frac{1}{4}$ grain with $MgSO_4$ varying from 25 to 50 per cent. Seventy-five received the combination and 9 single doses of morphine sulphate, 2 had allonal and 1 was given codeine $\frac{1}{2}$ grain. Twenty-one had morphine sulphate less than two hours before delivery, and 5 less than one hour. The shortest time was thirty-six minutes, the longest thirty-one hours. Not a single case of these has any record of difficulty in respiratory function or of a blue or ashy color of the infant. Of the 4 stillbirths, none of the mothers had morphine before delivery, but of the 3 infant deaths, there was one set of twins weighing 1 lb. and 3 lbs. and one apparently normal infant, all born of mothers receiving morphine sulphate. The latter patient had two hours and forty-five minutes of intermittent anesthesia and a difficult delivery which may account for this death.

2. The second theory that oxygen caused the bleeding is met with these facts: There were 18 cases of more than normal bleeding. Eight had oxygen with some other agent. Nine had morphine at some time before delivery. Every type of anesthetic except ethylene was used. This fails to support the theory.

3. That Jewish patients required more anesthesia than others was found to be true. Of 87 patients receiving 105 medications, 27 were Jewish patients who received 51. This is 31 per cent of the total patients, receiving 50 per cent of the medications.

4. In spite of the fact that 39 episiotomies were done and 2 cesarean sections, the total time lost for surgical repair was thirty-two hours, forty-five minutes. Of these surgical cases 85 were for lacerations which might have been prevented or lessened by more expert anesthesia, in either having greater relaxation, or longer anesthesia, to allow the tissues to soften instead of tearing. It is still my theory that strengthening agents such as pituitrin or quinine are possible factors in hurrying the rate and increasing the strength of the pains so that lacerations occur, but statistics on this point are missing except in 3

cases. It is apparent from the fact that 136 women were in second-stage labor a total of 268 hours and twenty minutes without that relief possible with our present apparatus and knowledge, that we can be of greater service to the mothers.'

CONCLUSIONS

The Anesthesia Service of the Obstetrical Department of the Fifth Avenue Hospital is furnishing good instruction in the various types of anesthesias for obstetrical cases.

Complications of anesthesia as recorded in this series of cases have been limited to 1 patient, who had bronchopneumonia following vomiting while under anesthesia. This is an unusual record.

Morphine may be safely administered to the mother at any time prior to two hours before delivery, though 10 cases of vomiting after injection of morphine including the bronchopneumonia case indicate a possible source of maternal danger.

Oxygen is not a causative factor in the hemorrhage cases.

Jewish patients require premedication or anesthesia to a much greater extent than other persons.

Finally, the Service has done well but by careful observation and experimentation can improve the quality of the service both to the obstetrician and to the mother.

A MODIFICATION OF THE YANDEL HENDERSON RESUSCITATION APPARATUS

Apparatus and methods of resuscitation have long been the subject of our efforts, in an attempt to produce a simple and workable machine that will be foolproof. This apparatus does not reach the desired end, but is an approach to that end.

The machine consists of a high-pressure fine control valve, a graduated safety escape mercury manometer, and an inhaler. For convenience a stand is available. The method of using this machine is identical that used with the Yandel Henderson apparatus, from which this differs in eliminating the breakable and expensive flow meter, changing the type of safety valve and eliminating one valve entirely, and in the construction of the inhaler. A high-pressure tank of carbon dioxide 5 per cent and oxygen 95 per cent is attached to the yoke. By means of the control valve, to which the manometer is attached, the flow of gas is set at 8 mm. pressure so that with the mask in place, or with a finger closing the outlet of the control valve, small bubbles of gas will pass through the mercury and escape into the air. The inhaler is an adaptation of the dental inhaler of Forregger, consisting of an 8 inch rubber bag capable of withstanding 60 mm. mercury pressure. In the metal tube from the bag to the face piece, there is added a butterfly obturator valve. When this is closed there is no leakage from the bag except through the safety gauge. The dental face piece has been replaced by an infant face piece and rubber face mask.

Operation of the apparatus: Insert an infant rebreathing tube into the infant's mouth. Place the left palm up under the infant's back with the thumb pressing under the ribs over the stomach to prevent gas distending the stomach instead of the lungs. Tightly fit the mask to the face, having set the valve and distended the bag. Suddenly open the obturator valve allowing the pressure system to inflate the infant's lung. If the operator is not satisfied that this 8 mm. pressure is sufficient, the rubber tubing from the control valve can be pinched, the bag squeezed, and the lung distended in this manner. If respiration commences, leave the mask in place for five minutes; the pressure of 8 mm. in the apparatus is not sufficient to stop true respiratory effort. If in the period following the removal of the apparatus, after respiration has been apparently established, there should be cessation of respiration, proceed as before.

This apparatus has been used in 4 cases to date, and 3 of the infants have begun respiration promptly. In Case 2 there was a failure, the machine was not used until twenty-nine minutes of various methods

had failed to start respiration. This had been a difficult, long, breech extraction in a patient who had had 3 doses of morphine ¼ grain during the ten hours preceding delivery. All the other cases responded within 4 minutes after the effort to start breathing was begun.

In connection with this type of resuscitation it may be of interest to know that the apparatus used in the various emergency units of the Greater City of New York has been changed during the past two years from the Roth-Draeger pulmotor to carbon-dioxide-oxygen resuscitation.

TREATMENT OF BIRTH FRACTURES*

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THE obstetrician has to accept problems in dystocia not of his own choice, and though the highly civilized matron looks upon her contribution to the human race as a physiological function which should not be mixed with pathology, nevertheless, such admixtures are not uncommon; and when in the urgency of events, an obstetrician is unfortunate enough to meet with such a lesion as a fracture of the femur in the newly born, the problem of arranging for its care and protection is one of his added cares.

The pliable nature of the young bone, the lack of muscular development, the rapidity of healing, make for little displacement, seldom overriding, together with rapid correction of deformity and adjustment of length. Many simple procedures have been developed to handle the problem, all of which usually work well due to the basic conditions.

One more may not be amiss, especially where the case is either hospitalized or where relatives demand that an efficient looking appliance be secured. The device will do the following:

1. Suspend a child by the legs permitting traction by the weight of the body, as in the Bryant method.

2. Permit application and change of diapers and such care as the bowel movements and urine require.

3. Easy transportation of the child so that breast nursing is not interfered with.

It can easily be made by any person of moderate skill from materials readily obtained.

The principles involved are the old Bradford frame half covered to support the body; an upright extension to maintain suspension support for the legs; a binder, a leaf of which goes about the body of the infant, another leaf which is laced to the frame and holds the body to the covered part of the frame.

The illustrations will serve to make plain the construction and application. The frame is preferably made of the 6 foot Bessemer steel rodding found in hardware stores, or round bar iron of a diameter best suited to the weight and size of the child. Quarter inch to 5/16 inch suitable for the base, the same for the uprights, and 1/16 inch for the piece which acts as a means of keeping the blanket off the feet. The different parts can be wired together with small copper wire and soldered, or the copper wire covered with adhesive plaster to make a firmer joint and prevent the twisted end of the wire from scratching. The height of the support for the legs (Fig. 1, B-C) should be long enough to allow 3 to 4 inches above the sole of the feet with the buttocks raised above the base of the frame. The frame is covered from A to B (Fig. 1) with wide adhesive plaster

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applied transversely and lapped on the under side. This adhesive plaster is then brushed with melted paraffin to make it waterproof. The frame can be lacquered for the same purpose.

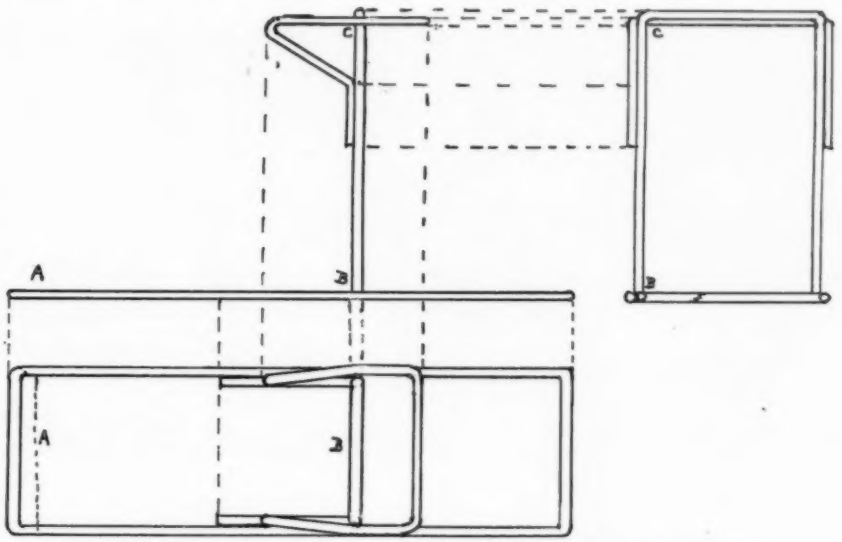

Fig. 1. Sketch of side, top, and end views of metal frame.

The next member is a binder made of two layers of unbleached muslin or strong canton flannel, each cut differently, and one super-imposed upon the other. These are stitched together at a point coinciding with the infant's back and for a width of 4 or 5 inches as shown by the lines D-E in the sketch (Fig. 2). The superficial layer of this binder is arranged for the body portion which is wrapped about the body from just below the anterior superior spines of the ilia to a transverse line extending across the chest about 1 or 2 inches below the anterior axillary folds. The upper portion tapers from the body piece and has two arm holes just above the latter. The cephalic end of this tapered piece has tapes upon it for tieing to the cephalic end of the frame. The wings should extend laterally to such a distance that when the body part is brought around the body of the infant with the arms through the arm holes, these wings will extend from the mid-clavicular line upward and form wing supports to each side of the head like a winged chair. The body portion is wrapped about the child, and may be held by safety pins, tapes, or this may be arranged as a Scultetus many-tailed bandage.

The inferior or posterior leaf is made rectangular, wide enough to lap over the sides of the frame and long enough to support the head. Small eyelets are put in the edges of the sides for lacing it along to the under surface of the frame over the adhesive-plaster part.

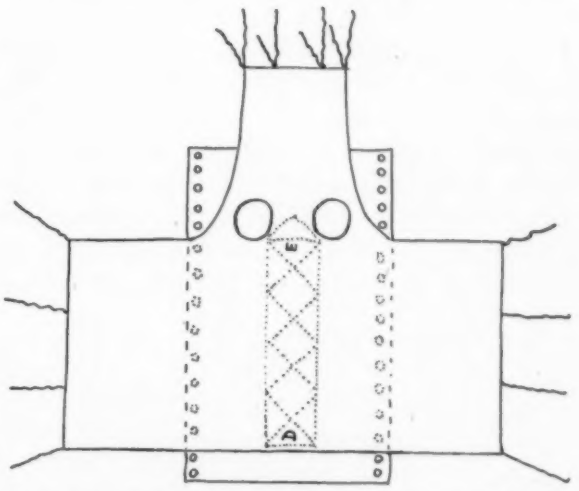

Fig. 2. Sketch showing outline of two leaves of binder, with body part superimposed on part which is laced to frame.

Adhesive traction straps are applied to the lateral surfaces of each leg, and carried over small spreaders. These

spreaders should not be any wider than the distance between the external and internal malleoli of each ankle. The spreaders are then attached to one transverse piece of splint which controls rotation of the lower fragment.

The body binder is placed about the child, the child is laid on the adhesive portion with such padding between the binder and frame as is deemed necessary. The legs are suspended by attaching the transverse wooden piece to which the spreaders are attached to the cross wire on the top of the suspension upright. The arms being through the arm holes, the body binder is wrapped about the child and fastened. The under piece is laced to the frame in the back. The upper end of binder is tied to the cephalic end of the frame, so that the winged extensions support the head laterally as shown in Figure 3. A diaper or pad can be adjusted beneath the buttocks of the child, and the whole placed on a pillow in the bassinet.

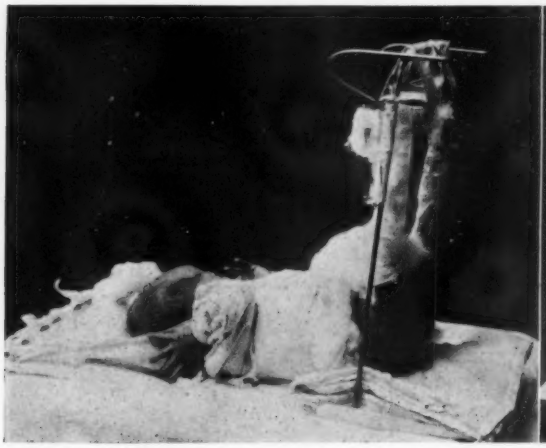

Fig. 3. Infant with fracture of femur with frame adjusted.

Fig. 4. Infant in frame wrapped up and asleep.

The frame without the upright for leg suspension and with lateral extension can be used for arm lesions, by fixing the baby to the frame with the binder.

It is well to make two binders, so that one can be laundered and changed when necessary.

A child in this apparatus is shown with a typical birth fracture of the femur in Figure 3. It could be nursed at the mother's breast, which the wings aided by supporting the head. The child was easily transported and changed.

PROLONGED RETENTION OF PLACENTAL REMNANTS*

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THE case presented in this article was under our care on the Surgical Service of the Fifth Avenue Hospital, and gave rise to considerable discussion involving the possibility of retention of placental tissue in utero for a period of six years. The unusual nature of the condition from a medical standpoint, and

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its importance from a medicolegal point of view led to the report which follows, along with a search of the literature.

Fig. 1. Photomicrograph of specimen in case of prolonged retention of placental remnants (high power). V, villus; C, calcification; N, necrosis.

Mrs. S. B., aged thirty-five, married, was admitted November 2, 1928 with a chief complaint of uterine hemorrhage. Her past history was irrelevant, excepting for the fact that she had had three pregnancies, with two living children, and had a miscarriage six years ago. Since that time her menses have been perfectly regular and normal. Coitus during this period was not denied. Her family history was negative. Her last menstruation occurred on October 4 but since then she had had some bleeding daily. On October 5 and off and on for two weeks she also passed clots. She has had no pain at any time, but complained of extreme weakness.

Physical examination revealed a uterus barely palpable above the pubis. Bimanually, the uterus was enlarged, softened, cervix slightly softened with softening of the lower uterine segment. There was no effacement, but the cervix was dilated sufficiently to admit the tip of the index finger. The adnexa were negative and the bleeding moderate.

The diagnosis made by two examiners was submucous fibroids and by one was incomplete abortion.

The operation was performed on November 3. The cervix was grasped with a tenaculum and brought down, dilated to one finger's

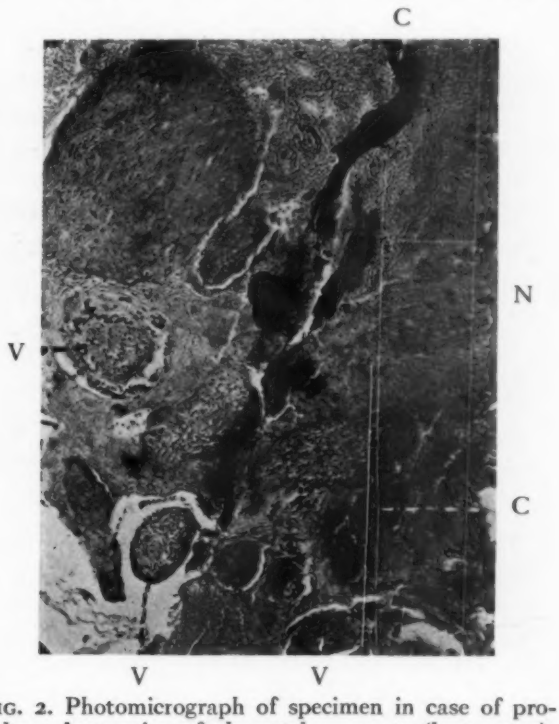

Fig. 2. Photomicrograph of specimen in case of prolonged retention of placental remnants (low power). V, villus; C, calcification; N, necrosis.

breadth and curetted with a sharp curette. Considerable material was obtained which had the appearance of placental tissue and was removed with some difficulty. Bleeding was profuse and the patient went into shock. Uterus and vagina were tightly packed and the patient received 800 c.c. of 10 per cent glucose intravenously and various stimulants.

She gradually improved and the packing was removed the next day. Bleeding was then very scant. She was discharged nine days later and the uterus found to be normal in size and position, adnexa negative, cervix closed.

Pathologist's Report. "Curettings consisted of a large amount of pale tissue, some rather firm, other fragments rather soft and spongy. Microscopical examination: Chorionic villi and decidual cells. Areas of necrosis and inflammatory infiltration. Paraffin sections confirm frozen section diagnosis and show also some calcareous deposits. Diagnosis: Inflamed placental tissue."

Discharge diagnosis: Retained placenta from incomplete abortion.

Follow-up examination one month later was negative.

The only history of recent pregnancy in this case was one of miscarriage at the third month, six years preceding admission, and the question arose as to the possibility of retention of placental tissue for such a long period of time. This led to a search of the literature and the amount of data available from this source was not very great.

In 1894, the subject received considerable attention from the profession resulting from a lawsuit (Kitson vs Playfair and wife)[30] involving persons of prominence in London society, and which is briefly summarized herewith:

The plaintiff, Mrs. Kitson, consulted her physician complaining of pains in the back, headache, sleeplessness, indigestion and vaginal bleeding. The history revealed that she had two children and five or more miscarriages, the last of which occurred in October, 1892. Her menses recurred in December, 1892 and were regular until the end of 1893 when she missed one or two periods. She had not seen her husband for twelve months.

The plaintiff's physician called the defendant, Dr. Playfair, in consultation. The uterus was found to be enlarged and the cervix partially open, and on curettage placental tissue was obtained. This was examined microscopically by J. Bland Sutton and declared by him to be recent placental tissue.

Dr. Playfair was related to Mrs. Kitson by marriage. He believed the tissue to have resulted from a recent abortion and threatened to inform his wife (Mr. Kitson's sister) unless Mrs. Kitson could prove that she had seen her husband within the preceding three months. This she could not do, with the natural consequences.

Mrs. Kitson then sued Dr. Playfair and his wife, and after considerable medical testimony, she was awarded a verdict of £12,000. Her verdict was won on two points:

1. The allegation of Dr. Playfair in regard to the plaintiff's infidelity was not sufficiently founded.
2. Dr. Playfair violated professional secrecy.

The testimony brought out many details involving prolonged retention of placenta, and for some time thereafter cases of similar nature were reported in the medical periodicals.

Commenting editorially on the subject of the pathologists' findings in the case, the *British Medical Journal* quotes an unnamed "well-known expert in uterine pathology" as follows: "Thus recent villi may look as though old, whilst even after very severe morbid changes around them, villi may appear perfectly new, though out of function for months. This is seen in well preserved polypi, where the microscope discloses well preserved villi though the date of the last pregnancy may be remote. The piece of placental tissue in such a case has taken root in the uterine wall and that kept its constituents alive."

Some of the cases reported in the literature subsequently follow:

Palmer[14] refers to a case of Dr. Trush in which prolonged efforts were made to deliver a full-term placenta, but they were unable to do so. There was no postpartum hemorrhage. The placenta was never delivered. The patient again became pregnant two years later with a repetition of the previous third stage.

Ross[3] reported the case of a woman who had had several miscarriages, the last occurring eleven months before. This was followed by amenorrhea. She then developed a profuse leucorrhoeal discharge which was offensive at times. The temperature rose to 100–101°, then returned to normal. The cervix was dilated and the blunt curette sank into soft placental tissue and blood gushed out. The tissue was still firmly adherent to the uterine wall. The uterus was curetted and the patient made a normal recovery.

Godson,[8] referring to the testimony of Sir John Williams in the Kitson-Playfair case, presented a case contradicting the latter's statement. Sir John's remarks follow: "In the case of a woman with retained placenta we would expect to find frequent and constant bleeding. Her periods would be irregular. We would not expect her to pass a period where there was no menstruation." Godson's case had an abortion at three or four months, eight months before. She had a long period of amenorrhea and then profuse bleeding. He removed what appeared to be an entire placenta.

Howard[6] described a case which miscarried August 4, 1890. On July 7, 1891, a mass protruded from the cervix which was a fourth month placenta. She had had a history of irregular flooding during this period. That the placenta had not been delivered was further indicated by the fact that her husband had buried the fetus in a cigar box and had noticed no placenta.

A number of other cases have been reported in the literature.

Newman[12] reports the case of a woman thirty-three years of age who had six children, the youngest two years of age. She had not had regular attendants at her last confinement and after weaning her child she menstruated regularly. On physical examination her uterus was prolapsed and subinvoluted, cervix eroded. On passing a sound the uterine cavity was shown to be 4 inches long. She remained under treatment for two months. At the time for her regular menses she flowed and two days later delivered a three-month fetus and membranes without the placenta. Severe hemorrhage followed, the cervix was dilated and the placenta delivered. Two days later she had another hemorrhage with hard uterine contractions and expressed a piece of placenta. Next day she bled again and expelled another piece which had undergone fatty degeneration.

Richmond[4] reports a retained placenta after a two-month abortion. She had had hemorrhage for one month and then menstruated regularly and finally expelled the placenta spontaneously.

Gallant[7] reported a case of miscarriage at the fifth or sixth month, flowing freely for two months afterwards and then the menses recurred regularly for seven months. Then followed two months' amenorrhea and when she consulted him she had been flowing continuously for four or five weeks. A fetus and sac were then passed and curettage produced a large amount of degenerated placental tissue.

Johnson[23] reports a case delivered by a midwife by whom he was called thirty-six hours later because of retention of placenta. It could not be expressed but under anesthesia about one-third of a normal placenta was removed. Stony hard areas were present and tore the operator's fingers when he attempted to remove the remainder of the placenta. This was therefore left undelivered and was not subsequently passed, but in spite of this she delivered a year later of a normal infant without complication.

Bartolemy[24] reports the retention of a placenta for four months without serious results. Fruhinsholz and Mariot report delivery of a living infant followed by a fresh and an old placenta. Wenning[15] reports the retention of one-fifth of a placenta for a year without ill effects.

Dietrich[26] reports a case of placenta accreta which died and was autopsied showing the eventual fate of cases of retained placenta. In two previous deliveries the placenta was delivered manually and in the last, part of the placenta remained behind. The posterior wall was entirely replaced by placental tissue and on the anterior wall there were some white indurated remains of a previous placenta.

Rucker[23] in an excellent paper on the subject, reports a case which he at first thought was one of prolonged retention of placenta, but apparently later felt otherwise. However, he made a rather exhaustive investigation of the subject with a complete survey of the literature. He reports a questionnaire sent to members of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons making inquiries on this subject. 143 replies were received . . . 112 replied that they had seen none. 31 replied that they had. The symptoms presented varied. Four had no symptoms. The majority had bleeding in some form or other, described as spotting, frequent menses, profuse menses and sudden hemorrhage. Cases in which large portions or the entire placenta were retained seemed to bleed less than those in which a small piece was retained. Fever was mentioned in 7 cases, vaginal discharge in 6, cramps in 1. Many of the cases were diagnosed as uterine fibroids. One case of retention of the entire placenta was reported. The patient never again became pregnant and went through the menopause without incident and at fifty-three years of age was in excellent health.

CONCLUSIONS

The case presented, which had had a miscarriage six years previously, and since had had regular menses, without omission, denied the possibility of a more recent pregnancy, was curetted and a large quantity of placental tissue was obtained.

However, she acknowledged having had coitus during this period.

The pathological findings of necrotic and calcareous areas in the placental tissue obtained indicated that the tissue had been retained in the uterus for a long time.

We believe this to have been a case of retention of placental tissue for a period of six years.

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THE ETIOLOGY OF PYELITIS IN PREGNANCY*

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PYELITIS as a complication of pregnancy was originally described in the middle of the 19th century but it was not until the end of the century that it was given any serious attention.

Simple pyelitis is almost universally recognized as being a secondary infection. In most cases it has its origin in foci of infection in the upper respiratory tract and its accessory sinuses, in infected teeth,

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or in the gastrointestinal tract. Such pathology then should be carefully sought and cleared up as early in pregnancy as possible.

Of the predisposing factors in the gastrointestinal tract constipation undoubtedly heads the list. Some authors have expressed the opinion that as a result of intestinal stasis, there is an increased production of colon bacilli which eventually reach the kidney. Bacillus coli communis is the infecting agent in over 90 per cent of the cases. Occasionally streptococcus or staphylococcus are associated with the colon bacillus and very infrequently the gonococcus, pneumococcus or Bacillus typhosus.

Clinical evidence points to the probability of the infection reaching the kidney by way of the blood stream. However, it is a well-established fact that it is almost impossible to produce an infection in the urinary tract without some sort of obstruction. If the healthy resistance of the renal tissue is impaired by the damming back of urine from pressure on the ureter then conditions are favorable to the onset of inflammation in the area of lowered resistance. Its severity will depend on the virulence of the organism and the completeness of the obstruction.

That there is an obstruction in the urinary tract which precedes the actual symptoms of pyelitis during pregnancy is an accepted fact. How this obstruction occurs is still a much disputed question.

DeLee takes the stand that bacteriuria is found in a large percentage of cases of healthy pregnant women. He thinks this is probably due to constipation. The ureters, particularly the right, have been found dilated and filled with urine in about two-thirds of the gravidae coming to autopsy. This, he claims, is caused by torsion, stretching or kinking of the ureters due to the enlargement and dislocation of the pelvic organs, or the swelling of the bladder mucosa but not to compression, since the specific gravity of the pregnant uterus is about equal to that of the intestinal mass. Owing to the stasis of the urine and the bacteriuria a pyeloureteritis is easily set up but infection can reach the parts also through the blood stream or lymph channels.

Hunner, on the other hand, believes that in all cases of pyelitis of pregnancy there has been a pre-existing stricture of one or both ureters. This narrowing, he feels, may be congenital or acquired. He is convinced that time and more careful study will prove that some of the congenital cases are caused by inflammatory processes derived through the placental circulation. However, by far the greater number are acquired, the origin being in some cases traumatic, that is from an injury at operation or childbirth, or from pressure from tumors. A large number are associated with cancer of the cervix. A few are syphilitic. A simple inflammatory stricture due to focal infection in some other part of the body is overwhelmingly frequent when compared with stricture from all other causes. Hunner is convinced that the stricture usually originates from some focus of infection.

Hunner's work has gone far to revise opinions on the cause of the urinary stasis which undoubtedly exists in these cases. But to date the vast majority feel that the actual cause in most cases is pressure on the ureters by the pregnant uterus. Two or three outstanding facts have influenced many persons in this conviction: First, in 80 per cent of cases the pregnant uterus during its growth is deviated to the right side of the abdomen and is twisted on itself from left to right. The reasons for this dextroversion and torsion do not belong in the compass of this paper but may be found in any textbook on obstetrics. Second, in pregnancy there is a constant right-sided ureteral dilatation, the left ureter and pelvis usually escaping this dilatation, and a consequent more frequent occurrence of right-sided than of left-sided pyelitis. The knee-chest position in pregnant women with pyelitis frequently will give complete and lasting relief. The con-

clusions drawn by the adherents to this theory are that the ureter is compressed at the brim of the pelvis by the pregnant uterus, the urinary flow is obstructed, the urine becomes infected and pyelitis results.

Duncan and Seng, reporting a series of cases at the Royal Victoria Hospital, have demonstrated the hypertrophy and hyperplasia in the ureters during pregnancy and believe the factors responsible for this tissue change are (1) increased vascularity in the cervix and parametrium with the consequent production of congestion, (2) pressure from general pelvic overcrowding by the growing uterus, and (3) a marked congestion and distortion of the vesical trigone.

They believe that stasis, as measured by the inability of the renal pelvis and ureter to empty themselves within normal time limits, is a definite and universal finding in antepartum women.

Hofbauer, of Johns-Hopkins, after microscopic study of the parametrium in a series of 43 specimens obtained from pregnant women, reports the constant finding of a phagocytic tissue which appears at the base of the broad ligament during pregnancy. This is intensified by long labor and by the existence of infection.

Corbus and Danforth, stimulated by Hunner, have studied a series of cases at the Evanston Hospital and are convinced that the obstructive pathology is present before pregnancy begins. Termination of pregnancy in no case cured the urinary infection.

Rosenow is of the opinion that the first lesion is in the kidney parenchyma. Craig, on the other hand, adheres to the theory that the cause of the stasis is pressure of the uterus on the ureter where it enters the pelvis.

According to Waldeyer the bladder is displaced downward owing to the pregnant uterus. At a result of this downward displacement the ureter becomes kinked or narrowed at the point at which it crosses the bony pelvis. Urinary stasis and dilatation follow.

One of the most interesting phases of this subject has been the discussion of the route travelled by the infecting organism in reaching the kidney. Three possibilities generally considered are hematogenous, lymphogenous and urogenous.

(1) *Hematogenous Route.* The theory that colon bacilli are transplanted by the blood stream is the belief of most authors today, although in comparatively few instances has it been possible to isolate the bacilli from the blood stream. Widal and Bernard report 2 cases of pyelonephritis of pregnancy in which they isolated colon bacilli from the blood and urine.

(2) *Lymphogenous Route.* Since the work of Francke, who made an exhaustive study of the lymphatics of the large bowel, the lymphatic route of infection has received a good deal of consideration. He was able, by injecting the lymphatics of the large bowel, to prove that the lymphatics on the right side pass over the capsule of the kidney. According to Stahr the lymphatics of the kidney capsule communicate with the deep lymphatics of the kidney. Francke believes, therefore, that there exists on the right side and probably on the left communication between the large bowel and the kidney by way of the lymphatics.

(3) *Urogenous Route.* It was proved many years ago by Goldschmidt and Lewis, Markus and others that under certain conditions antiperistaltic movement may take place in the ureter, causing the contents of the bladder to be propelled into one kidney. Even a partial filling of the bladder suffices to obliterate the closure of the ureteral orifice, the result being that each variation in the intravesical pressure is transmitted to the renal pelvis.

By means of a series of cystograms made in normal persons by filling the bladder with various solutions opaque to roentgen rays Kretschmer was able to demonstrate regurgitation in both normal and pathologic bladders.

SUMMARY

In summing up, the conclusions arrived

at from the literature studied are as follows:

1. Pyelitis of pregnancy is usually found in the right kidney in the middle three months of the first pregnancy of patients of twenty-five years or younger.

2. It is usually a secondary infection with Bacillus coli communis the infecting organism.

3. Urinary stasis is a necessary accompanying factor.

4. This stasis is generally believed to be produced by pressure exerted by the pregnant uterus on the ureters at the brim of the pelvis.

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CONSERVATIVE SURGERY IN RENAL LITHIASIS*

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VARIOUS factors during the past several years have been responsible for an increasing conservatism in the surgery of kidney and ureteral lithiasis. Surgeons are more and more reluctant to sacrifice in part or in whole even considerably diseased kidneys, if by any reasonable means such kidneys may be safe to the body economy. If infection is overcome and good urinary drainage established, we have no accurate means of determining how great a comeback a kidney may make.

Beer's temporary hemostasis by means of a rubber tube clamped around the kidney pedicle has enabled us more accurately and with greater ease to explore a kidney and remove difficult and multiple stones, stones which a decade ago would have been untouched, left in place.

Some time ago we were very reluctant to do a nephrotomy for stones impossible to remove in any other way, viz. the large branched calculi occupying the entire kidney pelvis. We feared the bleeding and used through-and-through mattress sutures to control the bleeding. Such sutures destroyed the kidney tissue in which they were placed. Denning's fine research has taught us that we can do a nephrotomy with impunity and if we place our sutures near the margin of the incised kidney we can control the bleeding and run no risk of damaging, to any marked degree, the kdiney function.

Quimby's perfection of the technique of the taking of roentgen-ray pictures of the kidney on the operating table has enabled us more accurately to remove all kidney stones at one operation. Fewer stones are now left behind.

Kidney surgery under spinal anesthesia

* From the Surgical Department, Fifth Avenue Hospital, N. Y. Submitted for publication April 20, 1929.

has, I believe, made operation less hazardous. When the anesthesia works, it lasts about one hour and the relaxation of the abdominal muscles is greater than under general anesthesia.

Fig. 1.

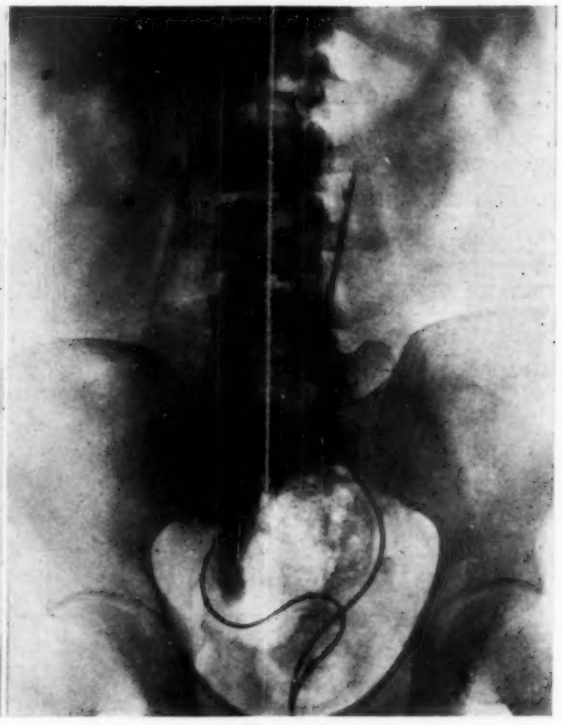

Fig. 2.

If the operation is to take longer than an hour, spinal anesthesia must be supplemented by general anesthesia. This complicates matters. The surgeon ought to be able to determine, in most cases, the probable length of a given operation and choose the anesthetic accordingly. I have done one nephrectomy for a large kidney tumor under spinal anesthesia. The anesthesia was perfect, so extensive operation and the large size of the kidney does not contraindicate spinal anesthesia.

At the present time, our knowledge of the various gradations of renal function and the ability of a kidney to do the body excretory work after the removal of its fellow diseased kidney is quite imperfect. If the kidney which is to remain excretes dyestuff (phenolsuphonephthaline, indigo carmine) normally, then we know that kidney is capable of doing the total body excretory function after the removal of its fellow. On the other hand, if both kidneys are reduced in function and it is necessary to remove one, a circumstance not often occurring, we can but guess as to

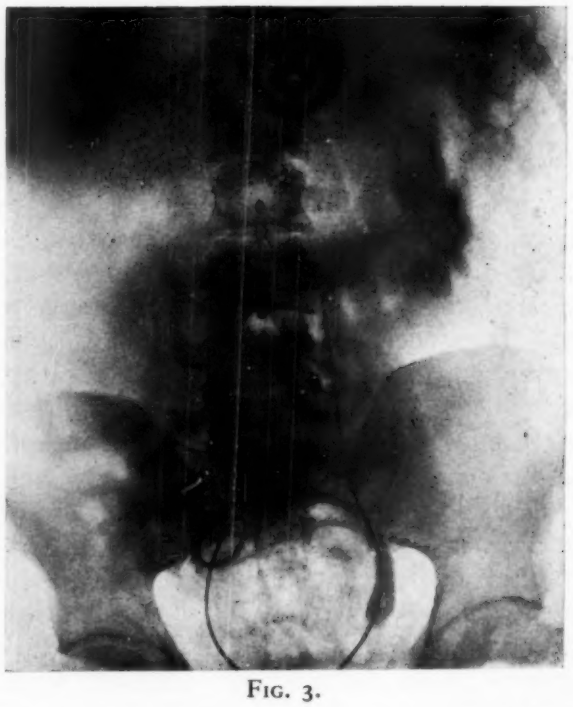

Fig. 3.

the possibility of the remaining kidney carrying on the body work. Such a problem arose in the following case:

Fig. 4.

Fig. 5.

Case 1. This patient, A. S., aged forty-seven, came to the hospital with the history of pain of several weeks' duration over the right kidney region.

His urine was cloudy with pus, he had but little temperature, his blood urea was 20 mg. per cubic centimeter and he did not look well. He was cystoscoped. An inflamed and ulcerated bladder was found, not particularly suggesting tuberculosis. Both ureters were catheterized, the right ureter with difficulty, the catheter stopping about half way up the ureter. The left catheter went up to the kidney pelvis easily. The right catheter began to drain thick pusy urine, while the urine from the left catheter showed more normal urine. Intravenous indigo-carmine was but little delayed in its excretion time on the left side while none was excreted up to fifteen minutes on the right.

A plain roentgenogram and a right pyelogram were attempted with the result shown in the Figures 1 and 2.

Thus we had, on the right side, a kidney badly damaged, excreting much pus, with a ureter strictured at the bladder end and much dilated half way up (at least with the ureter catheter curled up in it). A shadow showed in the lower end of the left ureter, lying on the ureteral catheter, which was presumably a stone. The patient was recystoscoped. This time relatively thick pusy urine was seen coming from the right ureter. Both ureters were catheterized and an intravenous phenolsulphonephthalein injection given. Red did not come from the left ureter until twenty-one minutes after injection, indicating a grave disturbance of the function of the left kidney and not entirely agreeing with the previous examination. We therefore decided to make a pyelogram of the left kidney, with the results shown in Figures 2 and 3.

The quantity of urine excreted from the right kidney was 5 c.c. with urea of 0.4 per cent while 4.4 c.c. were excreted from the left with urea of 1.2 per cent. So roughly quantatively the right secreted 2.0, while the left secreted 5.28, the left being about three times as good as the right but the right doing an appreciable part of the combined kidney work. We, therefore, had a badly damaged right kidney with at least one stricture of the ureter, which stricture has been sufficiently overcome to enable the kidney to drain fairly well. There was a less damaged left kidney with a

stone in the lower ureter. Notwithstanding the low blood urea, I believed that the removal of the right kidney would result in the patient's

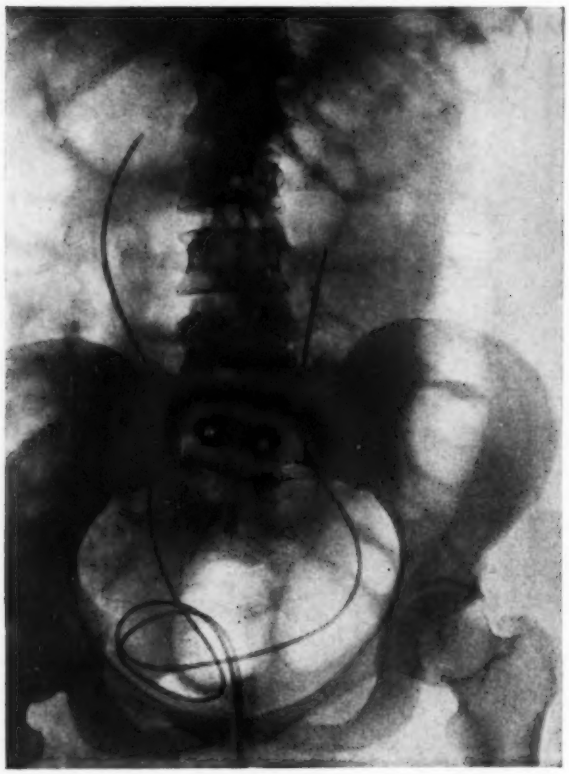

Fig. 6.

death from uremia. We therefore for a time at least had to temporize. We are at present pushing the patient's water intake and further dilating the ureters. If and when the patient's condition allows, the first move should be to remove the stone from the lower left ureter. How much the function of the kidneys will improve on dilatation of the ureters, remains to be seen.

Case II illustrates how very faulty our estimate of kidney function may be when a kidney is temporarily and partly blocked by a ureteral stone. If we had followed our exact data as to kidney function we might have removed a kidney (left) which after conservative operation functioned normally.

Case II. A male patient, forty-nine years of age, came with only a week's history of severe pain in the right flank radiating to the right groin. He came to the hospital and was cystoscoped. A catheter was easily passed up the right ureter while that up the left ureter met an obstruction at 2½ cm. Normal urine came from the right kidney with blue excretion three minutes after intravenous injection of indigo-carmine. None came from the left catheter for one hour and a very small amount of blue fluid was obtained from the bladder at the end of this hour. This lack of function of the left kidney was checked up at another cystoscopy.

Roentgenogram showed a right fairly large ureteral calculus at the level of the third and fourth lumbar vertebrae. There were two or three shadows in the right kidney which were suspicious of calculi. There was a large renal calculus in the pelvis of the left kidney. In the lower end of the left ureter there was a fairly large calculus 1½ inches long, filling the lumen of the ureter.

From our observation, the right kidney was at least functioning normally, but its function was endangered by the ureteral calculi. Notwithstanding the fact that we obtained no function of the left kidney, because of the lack of previous history we had an idea that there might be a fairly good kidney there.

The stones of the right ureter were taken out without trouble. When this wound was healed and the right ureter working well, we decided to tackle the left ureteral stones which were removed with considerable difficulty because they were practically all in the intramural portion of the ureter. These were removed and a free passage obtained into the bladder. The patient was in good condition so we rapidly and easily removed his kidney pelvis stone through a pyelotomy incision. The kidney looked entirely normal. Both wounds healed up without trouble.

Before the patient left the hospital it was found that the function of his left kidney, which previously according to our examination had no function, was normal.

He has lately come back to the hospital and a roentgenogram, pyelogram and gall-bladder series indicate that he probably has gallstones and a few small right kidney stones. We are going to keep dilating his ureter, sterilizing his kidney pelvis and see if he will not pass some of these stones. The sites from which the stones were originally removed showed no calculi.

This third case shows how a comparatively small stone of a kidney calyx can

cause a temporary reduction of kidney function. The increased function after the removal of the stone was surprising.

Case III. F. C., female, aged twenty-nine years, came to the Fifth Avenue Hospital with a history of attacks of general abdominal pain and vomiting.

Her physical examination revealed nothing but a moderate amount of tenderness on pressure over the left costovertebral angle.

A roentgenogram revealed in the lower calyx of the left kidney a small stone ½ inch long by ¼ inch broad.

The cystoscopy before operation November 7, 1928, revealed that the time excretion of phenolsulphonephthalein after intravenous injection from the right kidney was three minutes and from the left kidney was twenty minutes. No other comparative test of the renal function was made.

The patient was operated upon and through a nephrotomy wound, a small stone was removed. Some difficulty was encountered in finding the stone. The recovery was uneventful.

A cystoscopic examination after operation, December 1, 1928, showed that after intravenous injection of phenolsulphonephthalein red appeared from the right kidney in three minutes and from the left kidney in three minutes. The percentage phenolsulphonephthalein and percentage urea at this examination indicated that the left kidney was apparently functioning better than the right. This increase in functional capacity on the part of the left kidney is hard to explain after the removal of so small a stone.

The patient was admitted about a month later acutely ill and died shortly with a diagnosis of bronchopneumonia. Autopsy showed acute yellow atrophy of the liver. There was apparently no relation between the kidney condition and this.

A CASE OF INTRACANALICULAR FIBROADENOMA OF THE BREAST WITH ASSOCIATED TUBERCULOUS LYMPHADENITIS MISTAKEN FOR CARCINOMA*

Norman Treves, M.D., F.A.C.S.

NEW YORK

THE concurrence of tuberculosis of the breast with carcinoma of that organ has been extensively studied. Klose reported 17 cases personally observed. Other German authors, Bauer, Bundschuh, Franco, Fricke and Scheidegger have detailed such conditions. From the French literature are the cases of Hartmann and Massabuau, while Rodman, Smith and Mason, Deaver and McFarland have published histories of similar conditions. In many instances the axillary nodes revealed metastatic mammary carcinoma and tuberculous lymphadenitis. Leicher called attention to tubercular nodes in the cervical regions mistaken for metastases from laryngeal, pharyngeal and lingual carcinoma.

An unusually interesting case reported by Walther has no direct similarity to the present one but shows multiple lesions in the same breast.

The specimen was from the breast of a woman thirty years of age. The lesion was noticed ten months prior to operation but in addition a second nodule appeared near the periphery of the breast, which grew rapidly, finally causing redness of the skin. There was

* From the Surgical Clinic, Fifth Avenue Hospital. Submitted for publication April 20, 1929.

a tumor in the external portion of the breast the size of a lemon, freely movable and nodular, apparently an adenoma, but a smaller nodule near the areola was considered a scirrhous carcinoma. Microscopic examination revealed a fibroadenoma in parts, a cellular carcinoma in others and a small but typical area of tuberculosis. The axillary lymph nodes were entirely replaced with cancer.

Fig. 1. Intracanalicular fibroadenoma of breast with excess of stroma compressing cellular elements.

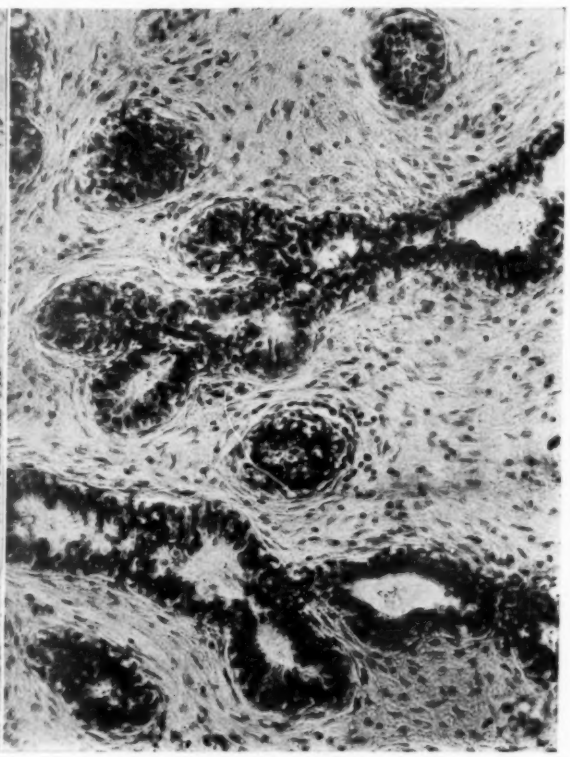

Fig. 2. Section of another portion of tumor showing alveolar arrangement of acini.

However, the incidence of tuberculosis of the axillary lymph nodes with benign lesions of the mammary gland has appeared to be a rare occurrence. Jehn, in reporting the results of the autopsies upon 84 patients with tuberculous axillary lymphadenitis, found no benign breast tumors. A similar study by Prym fails to mention these co-existing conditions. Davis reported the case of an adenoma of the breast which, during pregnancy, became infected with tubercle bacilli. Axillary dissection failed to show invasion of the lymph nodes and he concluded that the case was one of primary involvement of an adenoma but the mode of infection was not determined.

The only case in the literature which appears similar to the one under report is that of Ravel. From his study he felt that all adenomas of the breast are of inflammatory origin and concluded that a fibroadenoma of the mammary gland associated with tuberculous axillary nodes was of tubercular origin. The discrepancy in this case was not commented upon for the nodes appeared subsequent to the discovery of the tumor. Most cases of tuberculosis of the breast are felt to be secondary to a primary focus elsewhere and when the mammary lesion develops secondary to axillary nodes it is concluded that the infection is retrograde (Duvergey). But the case which is the subject of this communication had neither tuberculous mastitis nor was the adenoma involved in a tubercular process.

Mrs. M. M., an Italian housewife, aged twenty-eight, was admitted to the service of

Doctor Frederic W. Bancroft on November 24, 1918. She had been observed one week prior to admission because of pain in the right shoulder, present for two weeks. A few days after the onset of pain several discrete masses were felt in the right axilla.

The patient's parents had died of causes which could not be ascertained. Three brothers and two sisters were living and in good health, as was her husband.

The past history was singularly free of significant or relevant complaints. There had been no pregnancies though the patient had been married for four years. Menstruation was normal and the breasts had never caused any trouble. She had influenza during the epidemic of 1918. A recent cough of three weeks' duration had been productive of occasional blood-tinged sputum.

Physical Examination. The patient was a well-nourished woman with no obvious anemia. Her weight was 148 pounds, 8 pounds below her average weight. There was no hyperpyrexia and only localized adenopathy. The examination revealed only positive findings in the right breast, axilla and the lungs. The breasts were well developed and moderately pendulous. The nipples and areolae were normal, on a level and equidistant from the midline. The left breast and lymph drainage areas were without positive findings. In the right breast to the outer side of the areola a small, slightly tender mass 2 cm. in diameter could be palpated. This was discovered on examination but the patient was unaware of its presence. There was no skin retraction nor dimpling and the tumor was not adherent to the deeper structures. Low in the pectoral region was a resilient, non-adherent lymph node 2 cm. in diameter and four larger ones, 4 cm. in size, were palpated in the axilla. These masses were not tender.

Examination of the chest showed expansion equal, regular, and without marked apical retraction. There was dullness at the right apex extending down to the fifth rib and slight dullness at the left apex. On auscultation diminished breath sounds, bronchovesicular breathing and occasional moist rales could be heard at the right apex. A bronchovesicular quality of the breath sounds was noted at the left apex.

A tentative diagnosis of fibroadenoma of the breast and tubercular axillary nodes was made. But complete blood studies and a rontgenogram were requested.

The blood findings were:

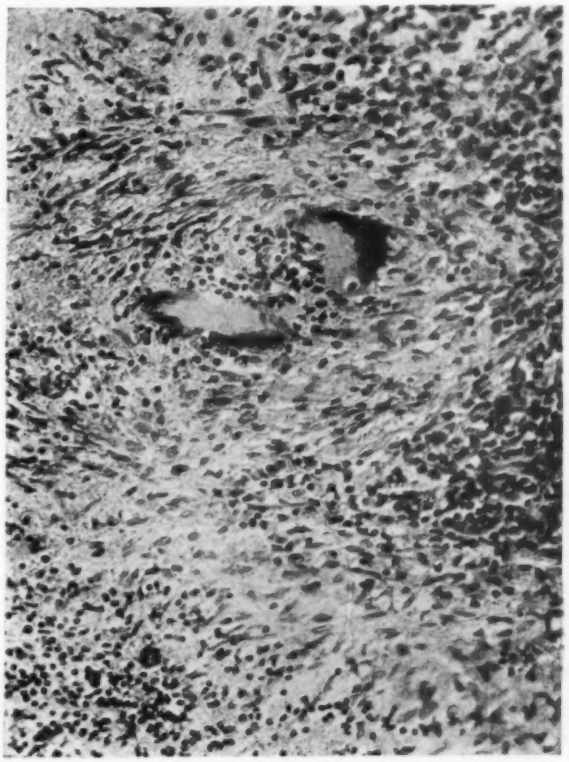

Fig. 3. Section from lymph node showing tubercle with typical giant cell, fibroblasts and caseation.

HB	85 per cent
R.B.C.	4,200,000
W.B.C.	10,000
P.M.N.	67 per cent
L.	31 per cent
Eosinophiles	1 per cent

The blood chemistry was normal and the Wassermann reaction negative.

Roentgenological Report. Dr. Lewis Gregory Cole and Dr. Robert E. Pound gave the following interpretation of the chest plate: "Film of the chest shows an infiltrative lesion throughout the upper half of the right chest and the left apex. The left apex shows numerous calcifications, while the infiltration in the upper right chest is of the soft type. I believe that this is a tuberculous process and active at the present time."

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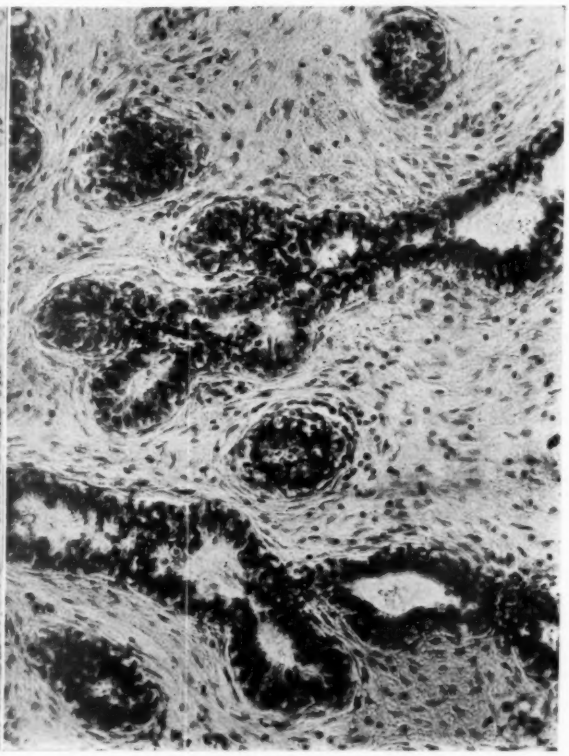

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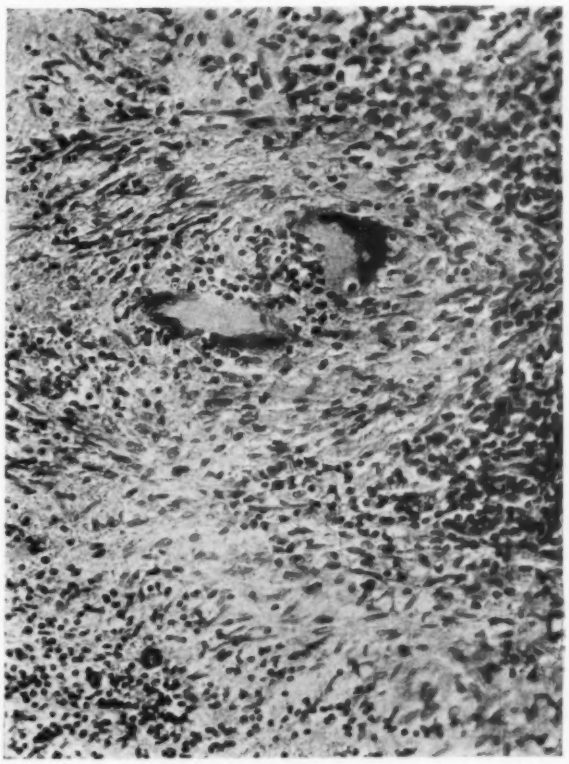

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Operation. On November 28, 1928 a simple mastectomy and axillary dissection were performed under ethylene anesthesia. Frozen section showed the nodes to be of tubercular origin and the breast tumor an intracanalicular fibroadenoma.

Postoperative recovery and wound healing were without incident.

Pathological Report. Dr. D. S. D. Jessup reported on the pathology of the specimen:

"Macroscopical Examination. First specimen removed for frozen section is a node 1 by 1½ cm. in size and on section is filled with caseous material. The breast is 16 by 13 cm., nipple not retracted. About 3 cm. from the nipple and below the deep fascia is an encapsulated nodule 3 cm. in size. Section for diagnosis taken from this point. About 3 cm. from this nodule is a smaller one about 1 cm. in size, which is also encapsulated and is fibrous on section. The axillary nodes, removed with the breast range in size from 2 to 4 cm. They all present much the same picture as the one removed for frozen section. Some of these have only a capsule of node left and are entirely filled with caseous material.

Microscopical Examination. The breast tumors show a growth of dense fibrous tissue between the acini and bulging into the tumor, spreading some of them out into narrow channels. Sections of the lymph nodes show tubercle tissue with large caseous areas."

Pathological Diagnosis. Intracanalicular fibroma of breast; tuberculous axillary lymph adenitis.

Subsequent careful examination of the specimen failed to reveal any focus of tuberculosis in the breast.

The axillary nodes in this case were probably the secondary manifestations of the pulmonary infection. It was reasonable to suppose, in view of the considerable literature upon the subject, that without surgical intervention the breast itself might have been involved in a secondary tuberculous mastitis. Most authors have agreed that secondary tuberculous mastitis has resulted from a retrograde embolic process through the lymphatics. We may presume that the early operation precluded such involvement.

The tentative diagnosis was correct, but the preoperative diagnosis in this case proved to be erroneous.

It is a well-established fact that bulky carcinomatous axillary nodes may be found without evidence of a primary mammary lesion or with a small insignificant focus of cancer in the breast. Malignant tumors of the breast in young women are quite formidable and of a high index of malignancy. We felt that we might have been dealing with such a condition in this patient, who was only twenty-eight years old, having a small mammary tumor and large axillary nodes. However, the axillary adenopathy with such findings in the breast in the presence of active pulmonary tuberculosis might have led one to the conclusion that the nodes were of tubercular origin. With such a setting, in future cases the more justifiable procedure would be an axillary dissection to determine the character of the nodes, followed by a local excision of the mammary lesion if the nodes proved to be tubercular.

HOSPITAL FOR RUPTURED & CRIPPLED

Sixteenth Annual Meeting of the Alumni, New York, November 19–20, 1928

THE PATHOGENESIS OF LEGG-CALVÉ-PERTHES' DISEASE BASED UPON THE PATHOLOGIC FINDINGS IN A CASE*

ROBERT K. LIPPMANN, M.D.

NEW YORK

DESPITE the extensive literature that has accumulated concerning Legg-Calvé-Perthes' disease, very few specimens of it have been available for pathological study. Zemansky,[1] about one year ago, was able to collect only 11 histologically studied true cases in addition to his own, and 3 of these represent merely tissue fragments removed at operation.

While the pathological findings in these reported cases showed sufficient conformity to identify the major disease criteria, there still remains much to be learned of the disease picture, and its pathogenesis is as mysterious as ever. For these reasons, additional pathological studies are of great importance.

There is, however, an additional factor of interest associated with the case to be herewith presented. In ten of the twelve previously reported studies no mention of the round ligament is made, while in the other two it is specifically stated that no trace of the ligament could be found on the specimen. We have been fortunate in this case to have, for the first time, the round ligament available for pathological study.

This specimen was obtained through the kindness of Dr. Samuel Kleinberg from the service of Dr. Royal Whitman at the Hospital for the Ruptured and Crippled. The clinical historyfollows:

I. K., aged twelve years, admitted Dec. 19, 1927, because of pain in the left hip joint and limp.

History. Six months ago this child was sitting in a chair with the left lower extremity doubled under her. When she tried to rise, she complained of sudden pain in her left hip. The pain persisted and it was noted that she limped. She was then treated for two months in bed by the family doctor but apparently there has been no improvement in the condition since she still complained of discomfort about the left hip and the family noted a persistent limp.

Examination. Examination showed a large overnourished girl of twelve years, weight 127 lbs., height 5 ft. She walked with a limp on the left lower extremity. On the table it was seen that there was slight atrophy of the left thigh and the extremity was obviously a little shortened and was held in position of abduction, about 5 to 10° and abduction was entirely restricted. Inward rotation likewise rather moderately restricted. Flexion was restricted at 100° and hyperextension exaggerated a little beyond normal.

R.U. 35¾	L.U. 34½
R.A. 30¼	L.A. 30
R.C. 13¼	L.C. 13
R.T. 17¼	L.T. 16¼

Diagnosis. Epiphyseal separation of the left hip joint. To have roentgen-ray examination and be admitted to the hospital for correction of deformity.

[1] ZEMANSKY, A. P. JR. Pathology and pathogenesis of Legg-Calvé-Perthes' disease. AM. J. SURG., N.S., 4: 169, 1928.

*Read at the Sixteenth Annual Meeting of Alumni of Hospital for Ruptured & Crippled, N. Y., Nov. 19–20, 1928.

Dec. 10, 1927, Dr. Whitman. This patient was very much overweighted and the development seemed to be very advanced and somewhat of the endocrine type. She walked with a marked limp on the left side. The left limb was practically extended, flexion limited at about 120° and accompanied by outward rotation. Abduction completely restricted. Rotation restricted about one-half.

FIG. 1. Sketch of specimen as received. Anterior to fringe of capsule can be seen a furrow in surface cartilage. Round ligament appears enlarged and protrudes stiffly from fovea capitis.

R.A. 31 L.A. 30¼

Roentgenogram showed that the upper epiphysis as compared with the normal was very much flattened and somewhat irregular and had apparently been displaced backward on the neck of the femur.

Dec. 19, 1927. Dr. Whitman. Reconstruction operation right. The joint was opened by the usual incision. It was then found that there had been no epiphyseal displacement but that this was an early stage of Legg-Perthes' disease of the "cap type." The head was flattened and the cartilage extended outward to the neighborhood of the trochanter. The ligamentum teres was found to be thick, red and swollen. The epiphysis was removed together with all the cartilage. The extremity of the neck was filed to a smooth and rounded extremity. The acetabulum was normal except that at the point where the ligamentum teres was attached there was a marked congestion and thickening of the soft tissues. The trochanter was transplanted in the usual manner and plaster spica was applied.

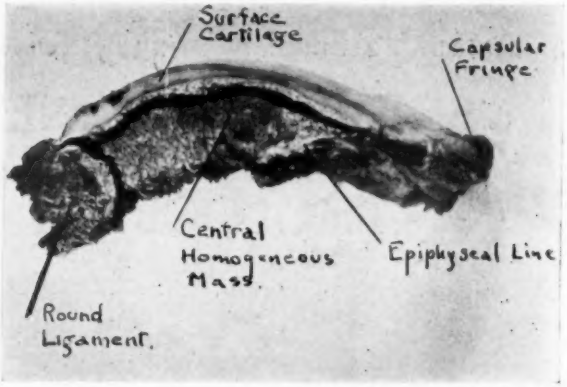

FIG. 2. Photograph of cross section of specimen showing homogeneous central mass and enlarged ligamentum teres.

EXAMINATION OF SPECIMEN

Macroscopic Appearance. The general contour of the femoral head was fairly well preserved although it extended outward toward the trochanter more than is normally the case. The crest was distinctly flattened. The surface cartilage was clear and white but marked with superficial indentations and grooves as if in accommodation to a shrinking of the underlying substance. One deep furrow, parallel to and anterior to the capsular insertion extended across the anterior surface and continued, more shallow, across the top.

The round ligament protruded stiffly from the fovea capitis as in the illustration (Fig. 1). It measured about 12 mm. in diameter at the site of insertion, was deep red in color, markedly injected and edematous.

Technique. The specimen was fixed in 10 per cent formalin for one week. It was then divided and sawed vertically into four sections of equal thickness. The blocks for microscopic section were cut from these divisions. Paraffin was used for imbedding.

Appearance of Cut Section. The surface cartilage was, with minor variations, of uniform thickness and normal appearance.

Fig. 3. Low power photomicrograph of typical tissue removed from necrotic area. Bone lacunae are all empty and lamellae are separated by a mass of homogeneous debris in which all cell structure is lost.

Similarly, the epiphyseal line appeared normal and unbroken with the exception of one area in the third block. In this block, the continuity of the epiphyseal line was broken about 1 cm. from the trochanteric margin. The interruption extended for approximately 3 mm. in the center of which appeared a small cartilaginous island. The bone lying between the surface cartilage and the epiphyseal line was yellow in color, in contrast to the normal bone under the epiphyseal line, which was red. The bony lamellae of the epiphysis were of normal appearance except for an area in the central portion, where they appeared to be compressed into a mass of debris (Fig. 2).

Microscopic Appearance. Microscopically, the surface and epiphyseal cartilages were normal in every way. However, the greatest part of the spongiosa of the epiphysis consisted of a necrotic mass. The bone lacunae in this area were all empty and the marrow was converted into a homogeneous mass in which all cell structure had disappeared. No red blood cells or remains of a vascular system could be identified. Figure 3 illustrates the extent of this massive necrosis.

Fig. 4. Reaction zone between healthy bone which adjoins round ligament insertion and area of necrosis. A. Healthy bone. B. Necrotic bone. C. Reaction zone.

Proceeding downward to the area directly above the epiphyseal line, a few islands of normal bone and marrow could be seen. In these areas the bone lacunae contained well stained cells, and were covered with osteoblasts. These islands merged gradually into the necrotic tissue directly above.

Approaching the round ligament and about 6 mm. from its insertion into the femoral head, the end of the necrotic tissue was encountered. It was here bordered by a thin wall composed of vascular mesenchymatous tissue in which polymorphonuclear leucocytes, small lymphocytes, plasma cells and giant cells are plentifully scattered. In this area, the bone lamellae were thickly covered with osteoblasts and there was evidence of rapid new bone formation (Fig. 4).

In the space between the thin reaction zone and the fovea capitis, the spongiosa appeared entirely normal. Several marrow capillaries in this area were markedly thickened. This finding will be dealt with in association with the round ligament vessels.

Approaching the trochanter, the necrotic

mass extended to the end of the spongiosa, *i.e.*, the junction of the epiphysis with the surface cartilage.

Fig. 5. Diagrammatic sketch showing distribution of lesion in four sections.

The second block to be examined showed changes so similar to those of block one as not to warrant a separate report. The slight difference in the distribution of these changes may be observed in Figure 5.

Block three was of more interest because in this section occurred the only spot in which the epiphyseal line was no longer intact. Microscopic examination confirmed the shape and characteristics of this rupture as described in the gross examination. Through this break, separating the healthy bone below from the necrotic tissue above, could be seen a dense growth of mesenchymatous or granulation tissue resembling closely that tissue bordering the necrotic mass on the ligamentous side. This tissue harbors inflammatory cells identical with those observed in the reaction zone on the side of the ligament. It is moderately vascular and is rapidly producing new bone of the "appositional" type (Fig. 6).

Block four showed bone and cartilage throughout to be normal in every respect.

The accompanying diagram (Fig. 5) illustrates the distribution of the above described changes.

THE ROUND LIGAMENT

Technique. The round ligament was fixed in formalin for one week, imbedded in paraffin and cut transversely. Sections were

Fig. 6. Rupture in epiphyseal cartilage filled with vascular mesenchymatous tissue and newly formed cartilage and bone. Clusters of leucocytes can be seen scattered in tissue. A. Epiphyseal cartilage. B. Mesenchymatous tissue.

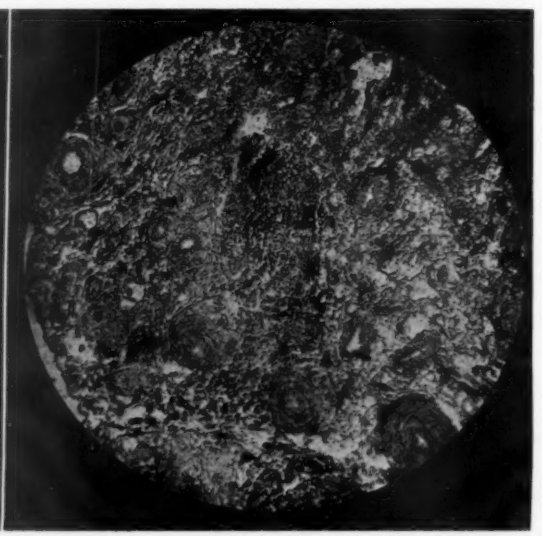

Fig. 7. Low power photomicrograph of tissue in peripheral portion of round ligament. Structure appears edematous. Most of arteries are thickened and several are completely obliterated. Perivascular infiltration can also be observed about most of arteries.

stained with hematoxylin eosin, Weigert, Van Gieson, Fibrin, Sudan III, methylene blue, Goodpasture and Mallory stains.

Microscopic Appearance. Edema and hemorrhage characterized every portion of the ligament observed. The tissues throughout were widely separated and permeated with extra vascular red blood cells (Fig. 7).

The periphery of the ligament, especially on one side, was composed of loose areolar tissue suggestive of granulation tissue harbor a network of capillaries. Some of these capillaries are old and show retrogressive changes (new elastica formation and endothelial proliferation). A few of them are completely obliterated. Others are unquestionably newly formed. Several of the thickened capillaries are surrounded by an infiltration of cells. These are mostly round cells but there are also many polymorphonuclear cells and occasional plasma cells. No thrombi were seen in any of the vessels.

SUMMARY

These essential microscopic findings thus observed may be summarized as follows:

Femoral Head. 1. There is a massive subchondral bone and marrow necrosis extending from the surface cartilage to the epiphyseal plate involving approximately half of the femoral head spongiosa.

2. This mass is bordered in places by a mild reaction zone composed of vascular mesenchymatous tissue in which small round cells, polymorphonuclear leucocytes and occasional plasma cells are scattered.

3. The epiphyseal line is intact except for one small break in continuity where a similar reaction tissue appears.

Round Ligament. 1. Edema and diffuse hemorrhage involve the entire structure.

2. The blood vessels of the ligament show obliterative thickening and many of them are surrounded by a cellular infiltration.

3. On one side of the ligament appears fresh granulation tissue harboring many distended capillaries.

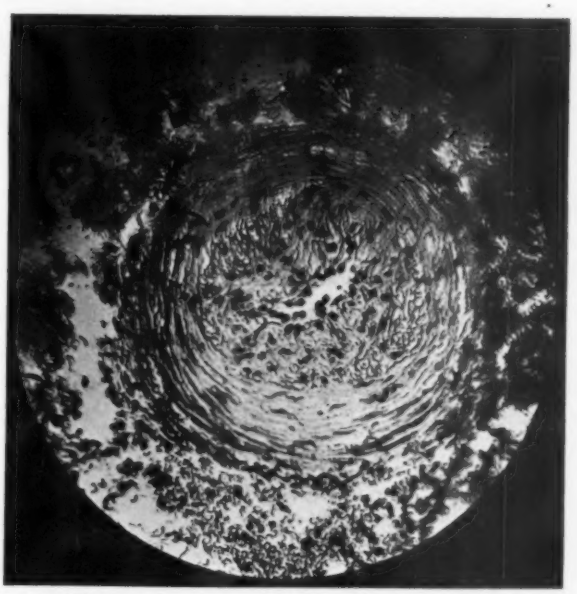

Fig. 8. High power photomicrograph of round ligament artery showing obliterative thickening.

DISCUSSION

The femoral head findings just described identify this specimen as that of an early Perthes' disease; the 13th pathologically described case found in the literature.

Of these 13 cases *massive subchondral bone and marrow necrosis* occurred in 12, and without question constitutes the outstanding feature of the femoral head pathology. *Granulation tissue,* present in all 13 specimens, must also be considered an essential part of the microscopic disease picture. The type of *cellular infiltration* is less uniform. *Giant cells* were mentioned as occurring in 9 specimens; *leucocytes, eosinophiles and plasma cells* were present in 5 of the group. The condition of the *epichyseal line* was described in 10 of the 13 pases. In 4 of them it was completely destroyed. In 3 the line was interrupted, while in the other 3 it was entirely intact. The *surface cartilage* was normal in 12 of the 13 cases. (The necrosis of this tissue in the thirteenth case, that of Walter, can be readily accounted for as the result of a severe hip-joint arthritis before the occurrence of Perthes' disease.)

Comparing the findings in our case with

those of all 13 cases, (as grouped in the above summary), it is apparent that our specimen represents an early and typical example of the disease picture. For this reason, it may well be used as a criterion in evaluating the applicability of the more likely theories of pathogenesis.

Primarily, the most casual examination discloses that the gross femoral head deformity is secondary to collapse of the underlying necrotic bone. Consequently, it is the cause of this necrosis that constitutes the cause of the disease. While as a result of study of other specimens most observers have arrived at a similar conclusion, current literature still contains reference to such diseases as rickets and arthritis deformans as plausible causes of the disease. Massive bone necrosis is not observed in the pathological picture of these diseases and they can be excluded with certainty.

On the other hand, local bone infection, or osteomyelitis, cannot be so easily dismissed. In fact, it is conceivable that some such bone process has produced this condition. Massive bone necroses with little or no surrounding cellular or tissue reaction have been observed, presumably as the end-result of long standing infectious processes, in aged people. However, in the above case, the disease was not of long standing nor was the patient aged. In brief, if an organism can be of such avirulence as to produce an osteomyelitis without suppuration, without involucrum formation or sequestration, it is an infective agent with which we have had no experience. There is nowhere in this specimen any tissue suspicious of tuberculosis or lues and it is safe to say that these diseases have played no part in the pathogenesis of this picture. Furthermore, despite painstaking examination of numerous sections of the femoral head and round ligament stained for bacteria (including spirochetes) no such organisms were discovered.

Thus, while bone infection cannot be definitely excluded as the basis of the necrosis in the examined specimen, there are many characteristics which suggest that vascular occlusion in the more likely origin. The intact cartilage, the complete absence of any remnant of vascular system in the necrotic tissue, and the mild type of peri-necrotic reaction simulate closely what would be expected as a result of aseptic infarction in this area.

Attention is thus directed to the vessels which, by their occlusion, might produce femoral head infarction. There are two such groups of vessels:

1. The lateral epiphyseal vessels.
2. The round ligament vessels.

The experiments of Bergmann have demonstrated that a focus of necrosis in the upper femoral epiphysis follows occlusion of the lateral epiphyseal branches in rabbits. Similarly, recent experiments of Zemansky and the author have shown that, in young rabbits, a condition closely simulating Legg-Perthes' disease can be produced by interference with the round ligament blood supply. Occlusion of the round ligament vessels was suggested as early as 1914 by Schwartz as the cause of the deformity in Perthes' disease. At that time, the importance of these vessels to the adolescent femoral head was much disputed and consequently Schwartz's suggestion received little support. A thorough consideration of the merits of Schwartz's theory in the light of more recent investigation is beyond the scope of this paper. It is, however, in this connection that the charges observed in the round ligament of our specimen are especially interesting.

The chief finding, vascular obliteration, appears to some extent to be a normal occurrence in children of this age. I have examined round ligaments removed at autopsy from 2 children of approximately the same age in which the femora were normally developed. Vascular thickening was present in these specimens but was much less marked than in the Perthes' disease specimen. No arteries were completely obliterated and, of course, there were no inflammatory changes. The study of more normal ligaments is necessary

before the vessel obliteration in this case can definitely be termed pathological.

The perivascular infiltration, hemorrhage and edema in the round ligament may be interpreted in several ways. It is possible that these phenomena are closely associated and that they result from vascular occlusion in or proximal to the ligament. It is also conceivable that the perivascular infiltration is directly due to the inflammatory process which has caused the vessel obliteration thus leading us to the source of Legg-Perthes' disease. Again, one cannot neglect the possibility that all of these changes represent nothing more than the result of irritation due to altered joint mechanics plus operative trauma.

In the present state of our knowledge it is futile to speculate further regarding the causes and relationship of these phenomena. Pathological studies of other specimens are under way and the normal characteristics of the ligamentum teres in the adolescent are being studied. It is hoped that these efforts will lead to a clearer conception of the above findings and of the pathogenesis of the disease.

In conclusion, I wish to express my thanks to Dr. Royal Whitman for permission to report this case, to Dr. Samuel Kleinberg for referring the specimen to me, and to Dr. Paul Klemperer for his valuable assistance in reviewing the material.

SUMMARY

1. The femoral head and ligamentum teres removed from a case of Perthes' disease are described.

2. The applicability of the more probable theories of pathogenesis is discussed.

3. The theory of vascular occlusion is adopted as the most fitting explanation of the pathologic findings.

4. The plausibility of the theory of occlusion of the ligamentum teres arteries is discussed in the light of the findings in the presented case.

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FURTHER OBSERVATIONS ON THE OPERATIVE TREATMENT OF LEGG-PERTHES' DISEASE*

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NEW YORK

THE operative treatment of Legg-Perthes' disease is based on the observation that irregularities of the articulating surfaces of the hip joint in childhood, of whatever nature, are important predisposing causes of arthritis deformans and progressive disability in later life.

Legg-Perthes' disease is apparently a primary necrosis of the head of the femur induced by defective blood supply. This is followed by a process of disintegration of the dead bone, its replacement by fibroid tissue and accompanying collapse of structure and deformity. The duration of the symptoms and the final effects are

* Read at Sixteenth Annual Meeting of Alumni of Hospital for Ruptured & Crippled, N. Y., Nov. 19–20, 1928.

determined by the area of necrosis, the character of the regenerative process and the secondary involvement of the joint. In the majority of cases, particularly those in childhood, according to the reports, the disability is slight, and practically complete functional recovery may be predicted within a comparatively short period.

There is however a group of cases estimated as about 20 per cent of the entire number in which disability may persist indefinitely and in which the disorganization of the joint is progressive. It is in this class that operative treatment may be indicated to relieve the immediate symptoms and to prevent future disability.

Three cases of this type, operated on recently, form the basis of this paper. All were in well developed adolescents so that loss of growth need not be considered, and in all the intervention was indicated by the character of the symptoms and the degree of deformity. Two of the cases have been described already[1] and they will be but briefly sketched.

The first patient was a boy sixteen years of age. The duration of the symptoms, essentially stiffness and discomfort in the right limb and limp, was between one and two years and the deformity of the head had increased in spite of the protection of a plaster spica. The second patient was a corpulent girl twelve years of age. She was brought to the hospital for persistent limp and restricted motion in the left hip joint. The onset of the symptoms had been apparently sudden, as she had remained in bed for several weeks for the treatment of rheumatism. The third case, a well developed boy, had been under observation at another hospital for two years. Originally a diagnosis of displaced epiphysis had been made, and an apparent reduction had been accomplished, but the symptoms of stiffness and discomfort persisted and the roentgenogram showed characteristic and progressive deformity.

The reconstruction operation, which was performed in these cases, is in substance the removal of the deformed head fashioning the extremity of the neck to a smooth, rounded extremity and transplanting the trochanter to the outer side of the shaft, thus by extending the area of the neck and restoring the leverage for the abductor muscles, reconstructing as far as possible the normal mechanical relations of the joint, hence the name.

From the mechanical standpoint the operation might be compared to an arthroplasty of the most favorable type. Thus improved function seemed fairly assured and there was the further incentive that direct investigation of the condition of the joint might demonstrate the true nature of the process.

In the first case the articular cartilage, in adaptation to the internal collapse, had been thrown into crumpled folds, but there was no evidence of arthritis. In the second case the ligamentum teres was dark red in color and congested, as were the tissues in the cotyloid notch, a condition that might explain the sudden onset of the symptoms. In the third case there was evidence of what might be interpreted as a mechanical arthritis, points of erosion of the cartilage both of the head of the femur and of the acetabulum and a growth of fibrous tissue on the cartilage, changes that might be explained possibly by the injury at forcible reduction of the displaced head, while the subsequent deformity might be accounted for by the incongruity of the articulation and by defective nutrition.

Thus it will appear that from the operative standpoint the characteristic feature of Legg-Perthes' disease is the deformity and these cases would seem to indicate that a variety of conditions may be included under this title.

The study of the specimens obtained at operation was undertaken by the late Dr. Zemansky,[1] and since his untimely death the work has been carried on by Dr. Lippman.[2]

[1] Am. J. Surg., 4:169, 1928; 5:385, 1928.

[1] Zemansky, A. P., Jr. Pathology and pathogenesis, of Legg-Calvé-Perthes' disease. Am. J. Surg. N. S., 4:169, 1928.

[2] Lippmann, R. K. See p. 785.

LEGG-PERTHES' DISEASE WITH SPECIAL REFERENCE TO PROGNOSIS & TREATMENT*

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THE course of disease in the mushroom type of coxa plana is distinctly different from that in the cap type. The mushroom type does not show so much atrophy, nor does it fragment as often as the cap type. The migration of this type toward the trochanter is rarely as much as the cap type, therefore, there is ultimately not so much limitation in abduction. The end-result in this type is reached considerably sooner than is the cap type.

The cap type of epiphyses practically always fragments, and migrates well out to the trochanter. After the fragmentation has taken place it begins to fill in with new corticle bone and ultimately becomes a solid epiphysis, but remains flattened. The course in this type may be four to five years.

FRACTURE OF THE NECK OF THE FEMUR IN CHILDREN†

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NEW YORK

BEFORE the introduction of the roentgen ray this type of fracture was rarely recognized in children and most observers denied even the possibility of its occurrence. At present the condition is frequently overlooked until a fixed and disabling type of deformity has developed. While a fracture of the neck of the femur may occur at any age, the young and the old appear to be particularly susceptible. Recently the writer reported the cases that had occurred during the last ten years at Bellevue Hospital. During the past twelve months 6 additional cases have been observed at this hospital and at the Hospital for the Ruptured and Crippled, the majority of which have presented bony deformity resulting from no treatment or improper treatment. The percentage of untreated cases in children that develop non-union must be very small, so that this result may cause little anxiety. These untreated cases, however, will present a striking limp with the disability increasing as the child grows older. The roentgenograms will usually show, in these cases, a shortening of the neck of the femur, upward displacement of the trochanter, and bony union in this malposition. This gives a mechanically unstable joint which is easily subject to arthritic changes later in life.

* Read at Sixteenth Annual Meeting of the Alumni of the Hospital for Ruptured and Crippled, N. Y., Nov. 19–20, 1928. Slides were shown of a case of coxa plana following atraumatic dislocation of the hip, also a case that showed a clear-cut area of absorption in the neck with a flat epiphysis from which no growth could be obtained on any media from the contents of this area.

† From the Hospital for Ruptured and Crippled, First Division. Read before Surgical Section, New York Academy of Medicine, December 7, 1928; and Annual Meeting of the Alumni of the Hospital for Ruptured and Crippled, N. Y., Nov. 19–20, 1928.

Whitman must be considered as the exponent of a radical reform in the treatment of fracture of the neck of the femur.

Fig. 1. Roentgenograms taken one year after a child, aged ten years, had suffered a complete fracture of the neck of the femur. This patient was treated by the abduction method and shows complete obliteration of the line of fracture.

This method he described in 1897, having presented a case before the New York Academy of Medicine several years previously. Taylor in 1917 reported 6 cases that he had seen and he believed that the usual type in children was an incomplete or greenstick variety to which he gave the name "hinge fracture." The youngest case that could be found on reviewing the literature was that described by Greig, occurring in a child two years of age. This patient gave a history of having fallen on the hip while in the act of climbing, and a roentgenogram showed a fracture of the neck of the femur with upward displacement of the greater trochanter. Several French observers have recently stressed a fact brought out by Whitman many years ago, that epiphyseal fracture or separation may be quite difficult to differentiate clinically from a fracture of the neck of the femur. Before the general use of the

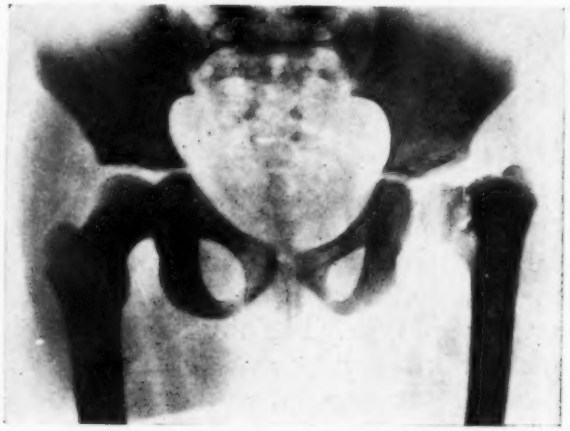

Fig. 2. Roentgenogram of Case 1 shows an untreated fracture of the neck of the femur in a child, aged six years, illustrating the resulting deformity.

roentgenogram this mistake was frequently made. At present we feel that separation of the epiphysis alone, in very young children, is an atomical impossibility due to the thick plate of cartilage covering the whole upper end of the femur. A real displacement of the epiphysis occurs usually in the overgrown, obese, or flabby type of adolescent child.

In the type of fracture under discussion the patient almost always gives a history of severe violence, such as a fall or having been struck by an automobile. These children as well as adults usually present shortening, outward rotation of the limb and pain on motion. The fracture may be of the complete or incomplete variety but in children the latter type presents very little disability and in several of the cases seen the patients were able to walk about with slight discomfort complaining only of pain referred to the region of the knee joint. Taylor tersely remarks that "if all hip injuries were carefully examined and roentgenograms taken at once, the surgeon would often be spared the mortification of an erroneous diagnosis and many patients would be saved from serious and sometimes lifelong disability."

The somewhat unsatisfactory method of

dividing this type of fracture into intra- and extracapsular has not been employed with the 12 cases observed, but the classification of Delbet has been used. He divided them into (1) subcapital, (2) transcervical, (3) cervicotrochanteric, and (4) pertrochanteric. The majority were of the complete cervicotrochanteric type and in only 2 cases did the fracture occur through the narrowest portion of the neck, a type extremely rare in childhood.

Fig. 3. Roentgenogram of Case III shows an old untreated fracture of the hip. The marked coxa vara with impingement of the greater trochanter against the ilium completely restricts abduction.

Seven cases ranging from three to eleven years of age have been treated by the Whitman abduction method and the other 5 cases show the results of improper treatment. Of the 7 cases seen early and treated by the abduction method 1 is at present in a plaster spica, the other 6 present excellent function with bony union and none of these cases show more than ¼ in. shortening. In contradistinction to this the 5 cases receiving inadequate treatment have all developed coxa vara with marked shortening and limitation of motion.

The Whitman method was first described over thirty years ago and it would be unnecessary to discuss the thoroughly accepted anatomical and mechanical basis for this procedure. However, it may be of interest to review briefly the essential features in the practical application of the Whitman abduction method, before adding the histories of some recently observed cases.

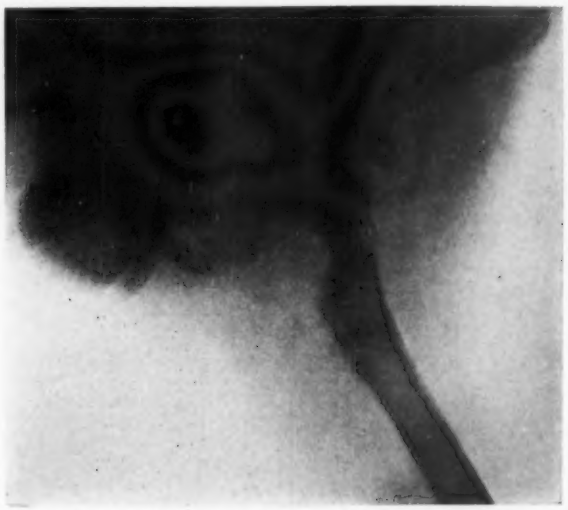

Fig. 4. Roentgenogram of Case IV shows a fracture that occurred in a child who had complete paralysis of both lower extremities.

The patient is anesthetized on a fracture table and while the operator steadies the pelvis, downward manual traction is made on both limbs until the shortening is overcome and verified by measurement of the sound side. Then the limbs are simultaneously abducted and a comparison is made of the bony landmarks. The fractured limb, while under traction, is held in the attitude of maximum abduction, moderate hyperextension at the hip, inward rotation, and slight flexion at the knee, by means of a long plaster-of-Paris spica extending from the axilla to the toes. A point to be stressed is that often abduction is incompletely accomplished. The bony prominences should be well padded and it is more satisfactory to have trained assistants hold the limbs while the plaster is being applied than to use the foot pieces on the fracture table.

Elevation of the head of the bed will render these patients more comfortable and by having then turned over in bed once or twice daily the danger of pressure sores, and in older patients lung complications, may be avoided.

Fig. 5. Roentgenogram of Case VI shows a fracture that occurred in a child, aged three years, who was first seen three months after the original fracture. Apparently there has been a refracture through the neck.

Fig. 6. Roentgenogram shows Case VI after reduction by the Whitman abduction method, illustrating the perfect position attained by this method.

While individual factors must decide the length of time the fracture requires immobilization, usually this type of fracture in children should be in the abduction spica about three months, if the fracture is of the complete variety. With the incomplete or greenstick type the period of immobilization may be shortened. On removal of the plaster the patient should not be allowed to bear weight at once but gradually become accustomed to moving and exercising the limb in bed; and in some cases it may be advisable to use a hip splint for the interval between the removal of the plaster and the actual weight bearing. Too early weight bearing is a frequent cause for the deformity of coxa vara developing at the site of the softened callus.

SUMMARY

1. Fractures of the neck of the femur in children are frequently unrecognized until bony deformity has resulted.

2. The deformity resulting from inadequate treatment of this type of fracture causes marked disability.

3. Roentgenograms of all hip injuries should be insisted upon as early as possible.

4. Early application of the Whitman abduction method will assure for these patients a restoration of the form and function of the joint.

CASE REPORTS

Case I. A girl, aged six years, walked into the clinic at Bellevue Hospital, complaining of occasional pain in the hip. She gave no definite history of any injury to the right hip but walked with a marked limp. Examination showed a slight flexion deformity at the hip with outward rotation of the leg and elevation of the greater trochanter. The limb was in an attitude of slight adduction and any attempt at abduction was restricted by bony deformity. Roentgenograms showed an old fracture of the neck of the femur with marked coxa vara.

Case II. A boy, aged six years, was recently admitted to Bellevue Hospital and gave a history of having fallen out of the open door of a moving automobile three weeks previously. He was unable to walk and the left leg was rotated outward, with elevation of the greater trochanter. Roentgenogram showed a complete peritrochanteric type of fracture and an abduction plaster-of-Paris spica was applied under ether anesthesia. Patient is at present in the spica and a recent roentgenogram shows a satisfactory approximation of the fragments.

Case III. A girl, aged sixteen years, came

to the Hospital for the Ruptured and Crippled, on account of pain and discomfort in the left hip whenever she walked a short distance. Pain was much worse in damp weather. The girl gave a history of having fallen and injured the hip at two years of age, but received no hospital treatment at that time. Roentgenogram at present shows a marked coxa vara with the deformed head in the acetabulum and a line representing the old fracture, of the complete cervicotrochanteric variety. The greater trochanter is elevated and resting against the dorsum of the ilium, thereby limiting abduction.

Case iv. A boy, aged ten years, in an attempt to get out of bed fell and injured the right hip. This child for several years had walked with crutches and wore double upright braces on account of an attack of infantile paralysis. A roentgenogram, made at the time of the accident, showed a complete transcervical fracture and the child received inadequate treatment. A roentgenogram taken a few years later shows absorption of the head and neck with marked shortening. The patient is still able to walk with the aid of crutches and braces, and refuses treatment.

Case v. A girl, aged ten years, walked into the clinic at the Hospital for the Ruptured and Crippled. She was wearing a high shoe on the right foot and the principal complaint was difficulty in walking. No definite history of injury could be obtained, but the roentgenogram showed a marked coxa vara deformity with a line of fracture through what apparently was the original neck of the femur.

Case vi. A girl, aged three years, fell from a fourth story window three months before admission to the Hospital for the Ruptured and Crippled. This child had been treated in another hospital with inadequate plaster support. She walked with a limp and presented limitation on motion, outward rotation of the leg, elevation of the trochanter and about ¾ in. shortening. A roentgenogram showed a fracture through the neck of the femur with a marked degree of coxa vara. In view of the age of this patient it was felt that attempts should be made at closed reduction, and under ether anesthesia the shortening was overcome and the hip stretched into an attitude of full abduction and inward rotation. A Whitman abduction plaster spica was applied. Patient wore this for two and one half months and at present there is ¼ in. shortening but satisfactory range of movement at the hip. While the complete reduction of the fracture was obtained, this case illustrates the danger of too early weight bearing; and the last roentgenogram shows that coxa vara has developed.

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USE OF THE ABDUCTION METHOD IN THE TREATMENT OF RECENT FRACTURES OF THE NECK OF THE FEMUR*

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BOSTON

At the outset, I wish to state that this paper will consider the treatment of recent fractures, and by this I mean fractures that have taken place in the neck of the femur within two or three days. I feel strongly that this, the Whitman abduction method, has its greatest field of applicability during this period, and that one of the errors which has subjected the method to criticism has been its application at a much later period when changes between the fractured surfaces leading to non-union have already been instituted. My remarks, therefore, will apply only to cases that have been seen within two or three days, and when the condition of the patient has warranted the application of what we consider proper treatment.

I shall not enter into details on the technique of this method, which is well known. One would feel that the technique should therefore be carried out to the last letter, but I doubt that Whitman's teachings are carried out properly in all cases. Hence the results of such treatment may be subjected to criticism founded on end-results, often including cases subjected to improper technical treatment. It is, of course, unfortunate that such conditions exist even in our best institutions, and under men who have apparently been trained along orthopedic lines. Surgery in general, however, is probably subjected to this same danger in many other branches, so that we can only call attention to these errors, and urge trained men to follow out lines of treatment that have been thoroughly established and proved to be of value, and encourage them to make no change in recognized methods until experience and age have really brought to them a better sense of judgment than most of us have during our earlier years.

One of the frequent questions asked in the treatment of elderly people by this method is the danger of anesthesia. We have practiced in New England in a large number of hospitals, and have taught this method to good men, and have been most gratified to find that it has been carried out as we taught it according to the original technique of Dr. Whitman. We have had no cases of pneumonia following etherization, a fact which we attribute largely to scrupulous immediate after-care in keeping patients constantly turned from one side to the other, allowing them out of bed at an early period, often as soon as the third day, and keeping them active, no matter how old, to prevent hypostatic congestion. In a number of elderly people we have adopted the use of large doses of morphine to narcotize the patient to the degree where this method could be practiced. Of late we have been quite impressed with the value and field of spinal anesthesia, which we have used in several cases with great success, and probably lessened danger. I merely call attention to this, not that it should be used as a routine, but that in properly selected cases it may be of considerable value. Here again, it should be properly given, supervised by men who understand its use and its dangers.

As to operative treatment in these recent fractures, we have never once practiced it, and feel very strongly that

*Read at Sixteenth Annual Meeting of the Alumni of the Hospital for Ruptured and Crippled, N. Y., Nov. 19–20, 1928.

open operative interference can be applied only to the field of non-union. And here, there are various methods that have been tried by skilled operators, and I believe the selection of the method depends largely upon one's judgment and familiarity with any of the two or three recognized methods of treatment of non-union of the fracture of the neck of the femur. We in Boston have found that the reconstruction method as outlined by Whitman can be done in a short space of time, and the functional results are satisfactory. The selection of one method, gaining familiarity and perfection of technique, I believe is of the utmost importance.

I have been asked especially to say something of our results. Here again, I want to state that these results apply to the recent cases, that is, those seen and treated within the first few days. The percentage of union in these cases has been extremely high, and satisfactory function has been obtained with the use of this method. So far as we are concerned, we have advised its use not only in Boston but throughout the larger centers of New England.

THE TREATMENT OF FRACTURE OF THE NECK OF THE FEMUR*

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In 1903 Bissell[1] proposed immediate operation for fracture of the neck of the femur on the ground that mechanical treatment as demonstrated in three of the leading hospitals of New York was futile. This conclusion had been confirmed during the present year by Katzenstein[2] who presented to the Surgical Society of Berlin a report of 169 cases of transcervical fracture, to which this discussion is limited, treated by conventional methods. The death rate was nearly 18 per cent and in but 11.5 per cent were the results classed as good. Löfberg,[3] on the other hand, in a similar number of fractures of the same type treated by the abduction method secured bony union in 67.5 per cent of the cases with a death rate of but 6 per cent.

Although these results were less favorable than those reported by Anschütz and Campbell of nearly 90 per cent of bony union, they might be accepted as fairly representative of unselected cases in hospital practice.

The immediate operation, as far as represented in the literature, has been restricted to cases of a favorable type and undertaken, it might be assumed, only by surgeons of exceptional skill and experience. The results therefore could be compared fairly only with a similar group in which the abduction treatment had been applied with equal efficiency.

In the treatment of other fractures operative intervention is indicated only when deformity cannot be corrected or apposition assured otherwise. These essentials, as far as might be determined by the tests considered conclusive for other fractures, might be more uniformly attained at the hip joint than in any other region of the body.

It is generally conceded that in a certain proportion of the cases, notably of the

[1] Bissell, J. B. *Phila. M. J.*, 11: 900, 1903.
[2] Katzenstein. *Zentralbl. f. Chir.*, Feb. 27, 1928.
[3] Löfberg, *Zentralbl. f. Chir.*, 54: 2222, 1927.

* A contribution to the discussion on the indications for primary pegging of the fragments. Read at Sixteenth Annual Meeting of Alumni of Hospital for Ruptured & Crippled, N. Y., Nov. 19–20, 1928.

subcapital type, there is an actual incapacity for repair and this factor together with the operative risk must be considered in the comparison.

The question for discussion therefore is whether the proportion of failure could be sufficiently reduced and functional results sufficiently improved to justify the hazzard of an open operation without testing conservative treatment.

The typical operation is the introduction of an intermedullary splint; and whether of autogenous bone as advocated by Albee, of beef bone as used by Hey Groves or of metal as demonstrated by Smith-Peterson, all shared the disadvantage of injury to the cancellous structure of the neck from which repair proceeded.

It has been claimed as an advantage of these operations that external splinting was either unnecessary or might be discontinued within a short period to permit exercise which might stimulate repair. This is a proposition of doubtful utility because the leverage of the limb must place a dangerous strain upon a frail and precarious support. Furthermore, in this fracture as contrasted with all others there was no formation of external callus and since the nutrition of the head fragment was often defective the reparative process was analogous to that of bone grafting, the first essential being secure fixation of the fragments for a relatively long period.

Granting that by direct inspection a more accurate adjustment of the fragments might be attained, the conservative method has the advantage that it entails no injury to the overlying parts and that the process of repair is not retarded by the space left by the removal of the metal splint nor by the nutritive changes incidental to the absorption of a foreign substance within the joint.

For one who for many years has been attempting to establish a comprehensive treatment for fracture of the neck of the femur in accord with surgical principles, the results of the Smith-Peterson operation are of particular interest because as contrasted with autogenous bone pegging they demonstrate the inherent capacity for repair if apposition of the fragments is maintained. If therefore it is conceded that a restricted class of patients is entitled to such highly specialized and expert service, it follows logically that the others comprising the great majority of the cases are entitled to an equally efficient conservative treatment.

Such a standard can be enforced only by holding the surgeon responsible for the primary essentials of functional repair, now attainable and physically demonstrable in practically all cases. In other words, since it has been proved by ample experience that fracture of the neck of the femur is now amenable to the rules that govern the treatment of other fractures it should share with them whatever protection from incompetence the liability to legal reprisal may assure.

The abduction treatment is a definite surgical procedure, of which the effects both on life and limb are determined in great degree by the skill and experience of those who apply it. At the present time it is not generally admitted that the most disabling of all fractures is entitled to expert care, and lack of training, particularly in plaster splinting, may best explain the modifications of the method that have been introduced as well as much of the adverse criticism to which it has been subjected.

A PLASTIC OPERATION FOR UNUNITED FRACTURE OF THE HIP*

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I WOULD like to preface these remarks by saying that the procedure I will now introduce is not wholly new, but based on the principles of the reconstruction operation of Whitman and the Murphy operation for ununited fracture of the neck of the femur. It is based on the assumption that the fractured head is viable and that by proper application to the reconstructed neck there will be firm union. The advantage of this procedure is that a normal joint is obtained and in addition to a painless stable hip there is a considerable amount of motion. The 2 cases done by this method by Dr. Nicola and myself have been exceedingly satisfactory and warrant a continuation of the procedure until we have a large series from which we can draw definite conclusions.

The usual semicircular incision extending downward from the anterior superior spine and across the thigh below the region of the trochanter is made. The trochanter is reflected with its muscle and the shaft of the femur dislodged. The neck is rounded and shaped in the usual manner; the head of the femur is removed completely from the acetabulum and reamed out sufficiently to assume a cup shape and fit securely over the rounded head of the femur. The cup-shaped head is held in place by a small bone nail. The reconstructed femur is then placed within the acetabulum and the trochanter displaced downward and fixed. The wound is then closed and the leg is placed in a fair degree of abduction and a plaster-of-Paris spica applied. The plaster is left on six weeks and walking is begun upon its removal. It is surprising the amount of motion and function that quickly returns. Neither of these 2 cases have had physical therapy.

RIB GRAFTING FOR SCOLIOSIS*

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NEW YORK

BEFORE describing the details of the operation of rib resection and rib grafting supplemental to spine fusion, a summary of its development might make its scope and indications more clear.

Nine years ago a patient came under my care, suffering from progressive scoliosis of the most severe type, with an extreme razor-back deformity. He could not for a moment discard apparatus without the development of constitutional symptoms and still further collapse of his spine. He had worn apparatus of all types: braces, corsets and plaster jackets. In spite of all precautions he repeatedly developed a pressure sore over the point of greatest convexity of the ribs. At such times he was forced to enter the hospital and lie in bed to permit healing of the ulcerated area. As time progressed this healing became more slow due to constantly lowered tissue vitality. Finally the ulcer was excised. The

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sutured wound left after the excision healed by first intention and the skin over the prominent ribs appeared normal, but on application of a most carefully padded, personally applied plaster jacket the same area promptly broke down.

It thus became evident that the underlying cause, the sharply protruding ribs, must be removed in order to cure these secondary effects. Sections of three ribs, representing their most prominent convexity, were therefore subperiosteally removed. Their arrangement bore no relation to the normal. Their direction was practically vertical, and they overlapped each other like the shingles on a roof, so that after removal of a section of the most superficial another rib was found directly below it. It was only after sections of three ribs had been removed that the pleura was encountered. About 4 in. of the most superficial rib were resected, three of the second and two of the third; in each case as much as their deformed structure permitted. The wound was closed in the usual manner and the patient placed upon a convex stretcher frame on which he remained during the period of regeneration of the resected areas of the ribs, a period of about six weeks. It was thus made impossible for that particular deformity to recur. His convalescence was entirely uneventful, the wound healed by first intention, and there was a considerable improvement in the appearance of the patient's trunk. He resumed wearing plaster jackets and since that time has had no recurrence of his pressure sore.

As time wore on it became evident that not only that particular patient but several others were condemned to wear apparatus that to be effective must be cumbersome, uncomfortable and unwieldy, and that, if the reverse, would be ineffective. The progression of the deformity which would follow removal of apparatus would cause grave constitutional symptoms, in which case the prognosis as regarded life was bad.

Under such painful circumstances one was forced to consider operative treatment, although the patients represented the most unfavorable possible class of cases for operation. The risks of such a procedure were carefully explained to parents and patients both, and in all cases they preferred any risk rather than the certainty of an harnessed lifetime.

At this point the second step of the operation presents itself. I have observed in operating upon the more advanced types of scoliosis, that at the point of maximum curvature the laminae on the convex side of the vertebrae were so overhung by the deformed spinous processes and ribs as to be in many cases inaccessible. The efficacy of the routine Hibbs operation was thus in these most severe cases diminished one third. It therefore occurred to me that this defect might be remedied by the use of a bone graft, and that for that purpose the excised sections of ribs were practically ideal. Their curvature, by some fortunate natural coincidence, almost exactly fitted the convexity of the spine.

The usual Hibbs operation, therefore, was carried out as far as the deformity in a given case permitted. The excised sections of ribs were then laid in the bed prepared for them on the concave side of the curvature, and the spinous processes split longitudinally and vertically to overlap the ribs and interdigitate with each other. The ribs were sometimes removed at the same operative session as the spine fusion, or at a previous operation, when they were preserved in alcohol, then boiled and used as dead grafts. This was determined by the condition of the patient. The ribs were sometimes split and sometimes used whole. Irrespective of their being split or unsplit, fresh or boiled, homologous or heterogeneous, in all cases the wounds had healed by first intention, none of the grafts or portions thereof had extruded, and in all cases they appeared roentgenologically to have been rapidly replaced by an unusually heavy deposit of bone.

After operation the patients were placed in a previously prepared posterior plaster

shell in which they lay for eight weeks. A plaster jacket was then applied which in turn eight weeks later was replaced by a brace. The cases of idiopathic scoliosis had discarded their apparatus entirely. The paralytic cases wore only apparatus, usually a duralumin Knight spinal brace, to support the unoperated portion of the spine. All the patients showed marked constitutional improvement, and were pleased with the result of the operation. In the series of 15 cases extending over five years there has been no mortality.

I wish to emphasize in closing that the operation was offered as a contribution in an extremely limited field, and that in contrast to other operations for scoliosis it was performed for, and its results determined by, the general constitutional condition of the patient.

BEEF BONE GRAFTING FOR SCOLIOSIS*

Samuel Kleinberg, M.D., F.A.C.S.

NEW YORK

SINCE the purpose of a fusion operation in scoliosis is to secure fixation of the spine and thereby arrest the deformity, I have introduced a beef bone graft on the concave side of the curve to assure bony fusion and solidity of the operated area.

My earliest spine fusions were performed on cases of moderate and severe scoliosis. In many of these the laminae and transverse processes were so markedly distorted that it was very difficult, and in some cases impossible, thoroughly to bare the posterior arches. Consequently the fusion of the vertebrae was not so complete as was desirable. In addition I found that while it was possible to reduce rapidly the curvature of the spine by weight traction on a convex frame, there was a strong tendency to immediate relapse when the traction was released. We had, therefore, two major obstacles to a satisfactory result. It occurred to me that these factors might be controlled by using a bone graft to supplement the fusion operation.

The graft, which is of beef bone, is usually about 3/8 in. in thickness and long enough to extend from one end of the main curve to the other. It is laid upon the laminae of the vertebrae on the concave side of the curve, and is fixed to the spinous processes of the vertebrae at both ends of the curve. Numerous cuts are made into the graft to facilitate vascularization. The fragments of the split spinous processes are distributed over and alongside of the graft to favor extensive new bone formation. The curve of the graft is decidedly less than that of the spine so that, when the graft is fixed in place, it prevents relapse of the curve to the preoperative state.

The advantages of the use of a beef-bone graft in a spine fusion for scoliosis are the following: The graft stimulates new bone formation; the graft maintains the preoperative reduction of the curve while the vertebrae are becoming fused because it is fixed at the ends of the curve; the graft is a scaffold for the deposition of a long and wide sheet of bone; the graft is particularly valuable in the severe cases in which it is impractical or impossible to do a thorough Hibbs fusion operation.

Beef bone is preferred to an autogenous graft because it may be prepared before the operation and has the required strength, length and thickness. In addition, the patient is spared an operation on the leg

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with its attendant trauma and inconvenience, and the total time of operation is at least twenty minutes less than it would be were an autogenous graft employed. The graft becomes fragmented in about six to seven months and gradually disappears in the course of several years. In the majority of the cases the graft is invisible two years after the operation. In several instances parts of the graft have remained unabsorbed as long as four and a half years.

I have used beef bone in 54 spine fusions for scoliosis. While at first I operated only on patients with severe deformities, I have in the last few years used the beefbone graft in fusing the mild cases in the belief that, if the graft is beneficial in the severe types, it will be of even greater prophylactic value in the milder forms. Of the 54 cases, 40 were idiopathic scolioses, 8 paralytic, 4 rachitic and 2 congenital. The ages of the patients ranged from nine to thirty-five years, but the majority were in the adolescent age period. Of the 54 cases 34 were re-examined recently. The time since the operation varied from one and a half to seven and a half years. In 27 the result was excellent, in 5 the result was good and in 2 cases there were failures. From this analysis I am encouraged to continue to use beef-bone grafts in the fusion operation for scoliosis, and believe that the addition of the graft aids materially in the ultimate stabilization of the spine.

THE TREATMENT OF FIXED OBLIQUITY OF THE PELVIS*

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By fixed obliquity of the pelvis is meant tilting of the pelvis due to a contracture of muscle groups resulting in an inequality of the length of the legs. The contracture is of such a nature that if the actual length of the legs is equal, the tilting of the pelvis prevents the patient from bringing the heel of the short leg against the heel of the long leg. If the pelvis is brought into a horizontal plane one leg will be abducted, the other adducted.

This pelvic obliquity may be divided into different types depending upon the muscle groups involved. In the simplest form it is due to a unilateral contracture of the abductor muscles. Secondarily there is a shrinkage of the fascia and in the severe cases also of the capsule of the joint. The second type is caused by a contracture of the abductors of one side and of the adductors of the opposite side. In the third type the situation is complicated by contracture of the spinal muscles producing a fixed deformity of the lumbar spine.

The methods of correction vary depending upon the type and the length of time during which the deformity has been present. In comparatively recent cases (those of a year or less) it is frequently possible to correct the pelvic obliquity without operative intervention. Traction is applied directly to the elevated side of the pelvis by means of a leather pad which fits the crest of the ilium accurately. The abducted leg is gradually brought into an adducted position and the patient is taught to press against a block at the foot of the bed so as to push this side of the pelvis up. The adducted leg has traction applied to it and is gradually brought into an abducted position.

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In the cases of longer standing, operative measures are necessary. In the first type where the contracture is unilateral, the operation consists in a complete division of all the tightened structures, namely, the fascialata, the abducting muscles and the capsule of the joint. This is best done by a long lateral incision; the tip of the trochanter with the abducting muscles attached to it is cut off with a chisel thus exposing the capsule of the joint. To maintain the leg in the adducted position the incision is prolonged down to the knee and a strip of fascia measuring 1 or 2 in. in width is dissected upward to a point about midway between knee and hip. The lower end of the fascial strip is brought across the thigh subcutaneously and is fastened under tension to the pubic spine in the region of Gimbernat's ligament.

In the second type, where in addition to the contracture of the abductors there is a contracture of the adductors of the opposite side, the first operation must be supplemented by a second operation in which the adductors are freely divided.

In the third type, after the first two procedures, traction must be applied to the spine so as to overcome the deformity due to the spinal muscles, and when the maximum of improvement has been gained, the lumbar spine should be fused by one of the methods now available. I have myself had recourse to a new type of bone graft running from the crest of the ilium about 2½ in. from the mid-line upward to the spine of the first lumbar vertebra, thus giving the lumbar spine an oblique support corresponding to the flying buttress of a cathedral. In addition a straight graft is placed between the split spinous processes by the Albee method.

SUPPURATIVE ARTHRITIS OF THE KNEE JOINT

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Heretofore the established procedure, more or less universally practiced, in the treatment of infected joints, however slight or severe, has been immediate immobilization of the infected joint or joints by means of splints, extensions, casts etc. If surgical intervention was necessary, incisions and counter incisions, all types of drainage tubes and various irrigations failed of their objective, due to their inability to evacuate the pus and eliminate the progress of the infection. In many cases resection or amputation followed.

The disadvantages of this method on the infected joints and the surrounding soft tissues were readily recognized, such as partial or complete ankylosis, atrophy of the muscles, destruction, contractions, and adhesions of the capsule. The treatment by immobilization had apparently been instituted for the relief of pain without considering the after effects on the infected joint. Many of these joints failed to yield either partially or completely to the usual physiotherapeutic measures. This, no doubt, was due to the lack of a more suitable treatment.

Before the War, Willems of Belgium treated simple industrial joint injuries by means of aspiration and found that immediately upon the relief of pressure these patients had free use of their joints without pain. This pain and loss of motion was due

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to distention of the capsule with fluid. Usually, one aspiration of the joint was sufficient to enable the patient to return to work within three or four days without a recurrence of symptoms. During the World War he successfully used this treatment on penetrating wounds of the knee joint in which there was no osseous destruction. Later it was used with good results on knee and elbow joints having secondary infections.

The treatment of infected joints by the method I am about to describe may be summed up in one outstanding statement as *arthrotomy with immediate active mobilization of the joint*. This is directly opposite to our former method of treatment by immobilization. The technique we use consists of a diagnosis accomplished first, by a consideration of the history of the case generally, and second, by aspiration of the joint locally, to determine the type of infection present.

Tuberculosis of the joint is the infection to which this method of treatment is not applicable.

The diagnosis established, the following treatment is begun: First, we will discuss the knee joint. A 2 to 3 in. linear incision is made about ½ in. from the patella on the inner or outer side and extending from the upper to the lower pole. A dissection is made down to the capsule which at this point is very superficial and a similar incision is made in the capsule. If the cut edges of the capsule are now grasped with the tissue forceps and the patella lifted, the rôle which the synovial surfaces play in squeezing the pus toward the wound can be readily observed by flexion and extension of the knee. We then see the two synovial surfaces come in contact and sliding one on the other, squeezing the pus toward the wound, whence it dribbles out if scanty or escapes in jets if considerable. If these movements are repeated frequently and are of sufficient extent, pus is expelled as soon as formed and there is ideal drainage without drainage tubes. It is then seen that flexion empties the lateral and the tricipital cul-de-sac while extension cleans out the inner osseous joint line in particular. This occurs, especially, at the point of maximum flexion and extension.

Following the opening of the capsule a small piece of rubber tissue is sutured to the capsule at the lower end of the incision to prevent closure and insure proper and consistent drainage. Care must be taken to prevent the rubber tissue extending beneath the capsule into the joint as this predisposes toward reinfection. A gauze dressing is then applied loosely to the incision to permit free drainage and unrestricted movement of the joint.

The same procedure applies in the treatment of the hip, elbow and shoulder. In the wrist and ankle joints incisions are made on both sides. The incision for the hip is made just external to the sartorious muscle. The shoulder joint is opened just opposite the anterior border of the deltoid muscle.

We shall now see that the operation is only a preliminary measure, in comparison with the real treatment of mobilization of the joint.

Mobilization should be started immediately after the patient recovers from the anesthetic and should be active. This is important, as it insures a greater degree of mobility in flexion and extension than if a longer period of time were allowed to elapse before motion is started. This treatment calls for an effort which the patient will make with the necessary perseverance only if he is constantly urged thereto. In this manner alone will we prevent muscular atrophy and retention of pus in the joint. One of the essentials in the successful treatment of the patient consists in acquiring his full cooperation by gaining his confidence. Having had before operation a very painful joint which he had carefully kept immobilized on account of increased severity of pain, he is now fearful at attempting any movement of the joint. It is, therefore, necessary to assure him that it will not be painful, but there will

be a slight stiffness on motion caused by the former immobilization.

The surgeon or trained assistant requests the patient to raise his entire leg to a right angle with his body, with the knee extended, lending him assistance if necessary. The patient then locks his hands around the thigh, the surgeon grasps the lower leg above the ankle and the patient is encouraged to flex the knee slowly, first being assured that the knee will not be allowed to bend suddenly. Following this, the patient will usually relax, permitting the knee to bend slightly, as sort of a test of your veracity. When he finds he is having no pain he will bend it still farther on until his fears become greater than your assurance. At this point, request him to extend the leg by his own muscle power. This will be quite an effort, due to atrophy, caused by more or less prolonged disuse of the quadriceps muscles. On second trial, he is very anxious to bend the knee farther. On the third or fourth attempt following at two-hour intervals (which has been our practice), the patient can usually flex the leg at least to a right angle with increasing motion each time thereafter, until he flexes and extends it normally without pain.

In cases of infection of the hip joint we have found that for complete expression of the pus the hip joint must be flexed to at least 10° or 15° more than a right angle. The same procedure applies to the elbow, shoulder and wrist joints. The incision is kept open until the discharge becomes serous in nature, and all thickening of the synovial lining has disappeared. This may take from ten days to ten weeks.

In our list of about 54 cases we have had 14 streptococci, 14 staphylococci, 1 diphtheria injection, 4 gonococci and 16 no growth. The majority of the 16 no growth cases were gonorrhea. Treatment: average, twenty-six days; shortest, ten days; longest, fifty-eight days. Duration of illness before operation: Shortest, one day; average, eight weeks; longest, two years. One failure; one death.

THE PRESENT STATUS OF SYNOVECTOMY*

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In attempting to present the present status of synovectomy I must, in the first place, qualify my remarks by asserting that my experience with the operation and my knowledge concerning it are confined to its use in chronic infectious arthritis, except for a few digressions to be considered later. As I see it, the chronic arthritides are best classified as hypertrophic, atrophic and chronic infectious arthritis. I believe that these three classes are definitely differentiated from each other; that they can be separated and properly grouped by adequate study of the individual cases, aided by the application of certain well defined guiding principles and characteristics. Furthermore, I do not see any logic in applying the operation of synovectomy to any type of arthritis other than the chronic infectious type. If the principles of the differentiation of these three types are correct, then it follows that hypertrophic arthritis is primarily a disease involving the bone ends; and infectious arthritis is a disease primarily affecting the synovial membrane. Since the operation is intended to influence the synovial disease in joints where this

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tissue is primarily involved, it seems illogical to attempt to apply it to any other type of arthritis and, so far as I am concerned, I cannot speak with any knowledge of the effect of such an operation upon any other type than that for which it originally was designed, with the exception as mentioned above.

The purpose of this operation is to remove the diseased synovial tissue where there has failed to occur a fairly prompt and complete resolution of the inflammatory exudate following an attack of chronic infectious arthritis. The basis for this declaration lies in the assumption that in the usual course of events, in this disease, there should occur a period of acute or subacute inflammatory reaction followed by the gradual absorption of the products of this process and the slow restitution of the functional integrity of the synovial membrane. Whenever such a resolution does not occur there remains a joint with a thickened synovial membrane containing a considerable amount of fibrous tissue which manifests itself by continued pain, limited motion, effusion and usually coarse crepitation on motion. It is to be assumed that such treatment as the elimination of focal infections, stimulation of the patient's resistance by vaccine therapy (by repeated injections or a specific vaccine or a few injections of a nonspecific vaccine) or providing a protein shock, accompanied by general constitutional hygienic measures intended to promote abundant eliminations and further calculated to relieve the patient of the burdens of worry, faulty nutrition, overexertion, etc. will, as a rule, assist in the processes of resolution. In those instances, however, in which such measures are unsuccessful or in instances in which such measures have not been undertaken and the resolution of the exudate does not take place, it is the purpose of the synovectomy to achieve this object by the manual removal of the damaged synovial tissues. It is to be hoped that this procedure will be undertaken at a sufficiently early period to prevent the development of extensive fibrosis of the joint capsule and ulceration and absorption of the articular cartilages which seem to result from too prolonged retention of an extensive inflammatory exudate. The question of the exact period in the arthritic process when it is safe or desirable to do a synovectomy must be decided by individual judgment in each instance. In general there is no object in the procedure if resolution is proceeding properly but there is no reason for not doing the operation at any stage of a monarticular or polyarticular process if it is apparent that the synovial inflammation is so extensive that irreparable damage is bound to occur. In addition there are some grounds for supposing that the early exhibition of this procedure in several badly involved joints may have the effect of shortening the whole process.

Since the immediate effects of the operation are to improve the mechanics of the damaged joint, it is thus seen that the first and important purpose is to restore the functional capacity of the joint as promptly as possible. As a byproduct of this result it becomes a corollary purpose to assist in restoring the individual to a more normal mode of existence which will indirectly thereby improve his hygiene, his metabolism, his eliminations and his resistance to further progress of the disease in the other involved or uninvolved joints which have not been operated upon.

The indications for this operation have been sufficiently clear in the statement of the purposes of the operation and so far as my personal experience goes, they are very largely as I have thus outlined them. However, since this is intended to be a statement of the present status of synovectomy, it is fair to call attention to the fact that Dr. Sneed reports excellent results following synovectomy in (1) syphilitic synovitis; (2) true traumatic arthritis accompanied by lipping, destruction of the semilunar cartilages, erosion of articular cartilages, and obliteration of the joint space; (3) benign tumors of the knee

joint; (4) osteochondromatosis with numerous free and attached bodies. Furthermore Ellis Jones says that in quiescent lesions he does not consider bony changes, such as lipping and osteophyte production or destruction of the semilunar cartilages and obliteration of the joint space, contraindications to operation. In fact several of his cases in which excellent functional results were obtained presented exactly such a picture.

The results of the operation have left me in a state of confusion, there having been, however, no disturbing postoperative complications. In all my cases there has been a fairly prompt restoration of a satisfactory functional state in the operated joint as an immediate result, but in several instances there has followed a relapse and in others there has been a gradual progressive crippling of other joints. I am, however, impressed by the probability that the further progress of the infectious arthritis in these unfortunate instances was largely conditioned by inadequate follow-up observation and treatment, or that it occurred in the relatively few instances in which the operation was undertaken in the wrong type of case and at a time when the exact indications for the operation were less well understood. On the whole, it is my impression that in properly selected cases the local result of the operation is a fairly prompt and very satisfactory restoration of the joint function. Constitutionally the results are favorable to an improvement in the patient's general well-being in proportion to the extent of his improved ability to walk and to carry on a normal mode of existence. It seems to me also that occasional unsatisfactory results may be accounted for by the fact that the operation was done at a time when the patient's general nutrition and resistence were at such a low point that the added burden of the operation actually hindered the spontaneous resolution of the exudate in other joints or prolonged the period of such resolution or permitted further extensions of the disease.

In several instances there has been occasion to reopen a joint several months after a synovectomy and there has been found a restoration of the membrane. Keyes in his brilliant research has shown what happens histologically after synovectomy. He found "In the rabbit the joint is again approximately normal sixty days after hemisynovectomy. The new synovial membrane is formed in situ by metaplasia of underlying connective tissue cells and there is little or no tendency for surface growth from the edges to cover the denuded area as occurs in the repair of a defect in an epithelial surface. The synovial cells are connective tissue cells slightly specialized by their location of a free connective tissue surface.

One of the greatest disadvantages of the operation is the fact that a temporary successful synovectomy may be followed by a relapse of the arthritis in a synovectomized joint or joints. This naturally is a very discouraging occurrence and might at first glance seem to be of sufficient importance either to make us hesitate to carry out the procedure or to abandon it altogether. I feel, however, that since a relapse in chronic infectious arthritis is a common experience in all plans of treatment we should look upon this regrettable phenomenon as we do when considering other plans of treatment.

Some help in evaluating the benefits of this procedure may be gained by reference to the results obtained by other surgeons. At the last meeting of the American College of Surgeons in Boston in October, 1928, the orthopedists of the Massachusetts General Hospital reported on a series of approximately 50 cases of synovectomy which had been done since 1923 and not including any case operated on less than a year previously. They were able at this clinic to bring back a large number of patients to exhibit the operative results. I must say I was surprised and pleased to see such a large number of satisfactory results and to find so many previously extensively crippled individuals restored to a considerable degree of usefulness. I

was also gratified to find at that clinic they were apparently confining the use of synovectomy to exactly the type of case in which it seems to me that the operation is most definitely indicated, namely delayed resolution in chronic arthritis. Dr. Gibson of Winnipeg recently informed me that he had secured very satisfactory results from this procedure, particularly in smaller joints and fingers in which he had been able to restore excellent functional capacity in a number of cases of marked disability of the hands. In a recent personal communication Dr. Carl Badgley of Ann Arbor, Michigan, told me that he has operated upon some 40 cases following this method and that he had in general been very well pleased with the results obtained.

On the whole, therefore, it would appear that in properly selected cases synovectomy has a very definite field of usefulness but it is not in a sense a panacea. Disappointments may follow its use, either in the form of continued progressive disease in the joints, or relapse in the operated joints. The extent to which the operation may be found to be indicated will probably depend to a large degree upon the efficiency of the early treatment or the severity of the process and its resistance to the accepted methods of treatment.

THE PREVENTION AND TREATMENT OF CONTRACTURES FOLLOWING CUTANEOUS BURNS*

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THE amount of deformity resulting from the contracture of scar tissue following burns depends upon the degree of the burn, the area and location of the surface involved and the period of time it takes to complete the healing of the wound.

In burns of first and second degree intensity there is no gross loss of tissue, as they do not involve the entire thickness of the skin and consequently no cicatricial tissue is formed. In third degree burns the entire thickness of the dermal tissue is destroyed and before this area is recovered with epithelium a varied amount of scar tissue may be produced. Deformities the result of cicatricial contractures are greater when the lesion is on a flexor surface than when on an extensor.

The longer a bare surface remains uncovered by epithelium, the thicker and less vascular become the granulations, resulting in an excess of scar tissue and a maximum amount of contracture. Therefore the more rapidly a wound heals, the less scar tissue will be produced.

In the treatment of burns the time may be arbitrarily divided into three periods.

In the first or immediate period, the time from the inception of the burn to the separation of the eschar, the indications are to save life.

In the second or intermediate period, the time from the end of the first period to the complete covering of the wound by epithelium, the indications are to hasten healing, thereby lessening the amount of scar tissue formation and preventing contractures.

In the third or late period the indications are to correct deformities.

Formerly the methods of treatment of

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burns were directed towards the care of the local lesion and the patient was allowed to die or live to suffer for days. It has only been suspected in the last ten years that the late shock and toxemia in patients with burns were the result of absorption of poisons from the destroyed tissue; and attempts since then have been made to prevent it. In 1925 Davidson of Detroit introduced the so-called tannic acid treatment of burns. This consists of the application of a freshly prepared 5 per cent solution of tannic acid to the burned area until the destroyed tissue is tanned and thereby rendered non-absorbable. This has resulted in lowering the death rate from severe burns by 50 per cent. This method also decreases pain, lessens the amount of infection, promotes healing beneath the eschar, and on the separation of the latter from the bare surface, the granulations are in the most favorable condition for immediate skin grafting.

The parchment-like eschar protects the wound from trauma and seals it off from contamination. As the eschar separates at its edges and curls up, it exposes normal skin when the burn has been of second degree intensity and rapidly advancing skin edges where the entire thickness of dermis has been destroyed.

The granulations, covering a bare surface from which a tanned eschar has recently separated, are thin, vascular and free from infection.

The tannic acid method is the most satisfactory treatment so far advocated in burns.

On separation of the eschar, wound healing should be promoted to limit the amount of scar tissue formed. In the case of small areas the epithelium of the skin edges and islands, where cells of the hair follicles remain, should be stimulated. This is best done by strapping with strips of adhesive plaster in a fenestrated manner. When the bare surface is large, skin grafting has to be performed. Grafts grow better on young granulations than on old. In old granulation tissue, the blood supply is depleted by the constriction of the vessels due to the contracture of the scar tissue in its deeper layers. Therefore old granulation tissue is pale in color and less resistant to infection.

Autogenous grafts are more successful than homologous, the latter type being seldom used.

Grafts composed of epidermis alone are not satisfactory as the skin developing from them is thin, abrades easily, is firmly attached to underlying scar tissue which contracts, frequently breaks down and does not stretch to accommodate itself to the movements of the part. The Ollier-Thiersch and Reverdin are grafts of this type.

Full thickness or deep "pinch grafts," placed close enough together, form skin which has not these objections. The technique is simple, the dressing and splinting are of importance. Later strapping with adhesive plaster will increase the rate of epithelium growth.

When flexor surfaces are involved, the part must be kept in extension during the healing process. This can be accomplished by position of the part, splinting or traction.

When deformities have resulted from contractures, operative procedures to relieve them should not be attempted until the contracture of the cicatrix is complete, the scar having lost its pink color. This is seldom before a year has passed. During this period, physiotherapy, occupational theraphy and splinting or traction may be of benefit in restricting the amount of deformity.

Plastic operative procedures should be carefully planned and slowly carried out in several stages. Most failures are due to attempting too much at one time, as new blood supplies have to develop between operations.

Wolf or full thickness grafts and pedicle flaps are procedures frequently used. The full thickness graft is applicable to surfaces on which normally there is little subcutaneous fat, as the hands and feet. The pedicle flap may be used on the face, arms, legs and where scars are adherent to bony surfaces.

THE USE OF FASCIA AS SUTURE MATERIAL*

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NEW YORK

THE use of living fascia has been a distinct advance in surgery, and especially in the surgery of hernia. It has been in use long enough and in a sufficient number of cases so that we can gauge its exact worth and know its limitations. There is no question but that living human fascia is much better than animal fascia or animal membrane which has been preserved in chemicals. I have used ox fascia in a number of cases, have felt that its use is not as satisfactory as when living human fascia is used, and have discarded it. I think it is perfectly permissible to use fresh fascia from one patient to another, and have done this in several instances with complete satisfaction. Any danger that syphilis might be transferred from the donor to the recipient is, I think, quite improbable.

It has been proved by animal experiments that when living fascia is inserted into a wound, many of its cellular elements remain imbedded in the scar. I have felt for some time that it should not be relied on actually to hold tissues together and therefore, should not be used under tension. For this reason, of late, it has been my custom in hernias with large openings, especially ventral hernias where there is some difficulty in bringing the layers together, to do this with chromic gut sutures which hold the layers together for a certain period of time, during which the fascial suture which has been laced backward and forward over this suture lines will take as a living graft. We have now done 443 cases in this hospital with 28 traced recurrences. We have reserved it for the difficult hernias, the very large indirect hernias, a great many of the direct, and many of the umbilical and ventral. In some instances, we have used it in cases which in former years we should have considered inoperable. Recently I did a Gallie operation on a large ventral hernia in a stout man using the chromic gut retention sutures and the fascial sutures above; and I feel that if he had been operated on by the older overlapping method, his trouble surely would have recurred.

We have now systematized the operation by using two operating teams working simultaneously, one on the hernia and one removing the fascia so that the fascia is ready for use when the hernia is dissected and the operation takes practically no longer than the old method.

Of course, there is a slightly greater chance of infection on account of the double operation. We had one bad infection where the whole wound was opened up and the fascia could be seen sloughing resembling the sloughing tendons in a suppurative tenosynovitis. We have had a few cases where there has been a slight serous discharge persisting for some time, but whether it came from the fascia or not it was impossible to tell. The removal of the fascia from the thigh is an exceedingly difficult procedure to accomplish under a local anesthetic, but a spinal anesthetic can be given, or the fascia can be removed from another patient under a general anesthetic and immediately used in the patient on whom the local has been used.

A very few patients have complained of pain and tenderness in the scar in the thigh for a long time. I have one patient who has developed a tender fibrous thickening almost resembling a fibroma, which may have to be removed later; but it is surprising how the fascia seems to grow back in place so that there is no herniation

*Read at Sixteenth Annual Meeting of Alumni of Hospital for Rupture & Crippled, N. Y., Nov. 19–20, 1928.

of the thigh muscles. The fascia of the thigh is much thinner in women than in men, especially so in the short fat women who so frequently have large hernias in which a Gallie should be done. When the strips are out, they are often found to be so slender as to be practically useless; and here again, it may be advisable to use the fascia from another patient operated on at the same time.

Another field in which fascia can be used with success is the open treatment of fractures. Here again, a warning should be given about its use under tension. I heard of a case recently where fascia had been used in a case of acromic clavicular separation where there was considerable tension and in which the separation reappeared. It seems to be probable that where fascia is used to hold together fractured bone surfaces, as for instance, a fracture of the patella, the fascia actually lives and becomes adherent to bone if not under too great tension. Patterson[1] advises the use of living and chemically preserved fascia as a means of fixation for fractures. His assumption is that the fascia lasts longer than kangaroo tendon or chronic catgut. Of course, it is perfectly possible that here also the fascia persists indefinitely as a living graft in the scar of the operation.

In conclusion I would say that our experience here for the last three years has led us to believe that we should use freshly removed autogenous fascia in all large indirect hernias, all direct hernias with weak musculature and all large ventral and umbilical hernias. Also that it is a good material to hold fractures in place provided that there is not too much tension on it.

[1] Patterson, R. H. *Ann. Surg.*, 88: 879, 1928.

THE INJECTION TREATMENT OF VARICOSE VEINS*

Ralph Charles Kahle, M.D.

NEW YORK

FOR the past few years papers on this subject both in this and the Old World literature have again brought to our attention the earlier work of Linser in Germany and Sicord in France, on the chemical obliteration of varicose veins. In the begining Linser used sodium chloride solutions and Sicord used sodium carbonate solutions. Many of us have noted in our own experience the obliteration of veins in the cubital area with injections of salvearsan preparations.

This method of the obliteration of varicose veins has been received with skepticism; but upon clinical experience has revealed many satisfactory results. These reports came in from various scattered surgeons throughout the world.

With the consent of Dr. Royal Whitman, I have undertaken to establish the efficacy of this treatment. This is to be a demonstration and not a study of end-results. Any suggestions will be appreciated.

The theories of the origin of varicose veins will be passed over by naming them only:

1. Congenital weakness of the veins.
2. Endocrine-ovarian disturbances.
3. Loss of nervi-muscular tone.
4. General weakness of connective tissue.
5. Phlebosclerosis.
6. Syphilis.
7. Infections of multiple, segmental type.

Having demonstrated by the Trendelen-

*Read at Sixteenth Annual Meeting of Alumni of Hospital for Ruptured & Crippled, N. Y., Nov. 19–20, 1928.

burg method that the deep veins are patent, the choice of solutions is at one's disposal. I have chosen sterile aqueous sodium salicylate in 20, 30, 40 and 50 per cent solutions. The quantity of these solutions injected to produce a chemical irritation of the intima depends on the diameter of the vein to be injected. A personal judgment is formed after failures only.

The syringes that I have employed are of the Tuer type of 3 c.c. to 5 c.c. size fitted with a 26 gauge needle of the length one's fancy or experience may dictate. A normal saline is kept on hand to dilute the solution when accidentally injected outside of the vein, to prevent necrosis of the subcutaneous tissues.

The question of using or not using a tourniquet is best decided upon by the operator's experience. I prefer a tourniquet above the area to be injected, employed only to demonstrate the filled vein, with removal of same as soon as the injection has been made. Then the patient holds with firm pressure a sterile gauze 2 in. by 2 in. square over it for ten minutes. This prevents leaking of the solution back into the tissues. I use tincture of iodine ½ strength to prepare the site of the injection.

The position of the patient is usually one of standing while the injection is made, with recumbency following immediately after the needle has been withdrawn, and rest for ten minutes. After this he resumes his usual vocation with very little discomfort; a marked step in progress over the operative confinement and anesthesia effects of the variously described surgical procedures.

Pain usually accompanying or immediately following the injection is only of a transitory type. It is at the site of the injection and usually for a distance of 6 to 10 in. below the injection site along the course of the vein. Sometimes it is present for a short distance above the injection site. It is spoken of as a cramp-like pain.

No sloughs or systemic reactions or emboli have so far been noted. There are 2 cases of fatal results reported in the literature: one by Hohlbaum,[1] apparently proved to be a fat embolus; and one by Hammer,[2] quite distinctly a case of mercurial poisoning, starting a few hours after the injection of a mercurial preparation and dying twelve days later with typical mercurial poisoning symptoms. Nine other cases have since been reported.

The resultant thrombosed areas are here demonstrated immediately after and for several weeks after the injections have been made. They resemble a great deal the phlebitis case one is familiar with in practice of unknown cause. A similar edema of the parts below the injection is noted for a number of weeks after the obliteration. Cord-like thickenings of the veins injected are felt after several days and for several months afterward. They appear reddened and tender. A hot water bottle or electric pad relieves discomfort after a day or two following injections in sensitive individuals. None of my injected patients have been "laid up" from their usual occupations.

At a later data I hope to demonstrate cured cases for a critical end-result study.

[1] HOHLBAUM, J. *Zentralbl. f. Chir.*, 49: 218, 1922.
[2] HAMMER, F. *Deutsche med. Wchnschr.*, 45: 45, 1919.

RECURRENT DISLOCATION OF THE SHOULDER

ITS TREATMENT BY TRANSPLANTATION OF THE LONG HEAD OF THE BICEPS*

TOUFICK NICOLA, M.D.

NEW YORK

I WISH to demonstrate another new procedure for recurrent dislocation of the shoulder. After reviewing the literature on this subject, one is impressed by the great variety of operations for this condition. They range from prolonged fixation of the shoulder to bone operation. This operation presented here utilizes the long head of the biceps to correct the condition. On the cadaver where it was worked out, the head of the humerus could not be dislocated even after all the muscle and capsule were divided.

The incision begins at the clavicle just above the coracoid process. It extends down for 4 in. along the anterior aspect of the deltoid muscle between the pectoralis major and the deltoid. The long head of the biceps is then exposed and divided, ½ in. above where it dipped under the pectoralis major. The proximal end is then exposed up to its insertion, the superior surface of the glenoid. A hole is then drilled through the head of the humerus beginning at the bicepital groove, at the level of the transverse humeral ligament, and extends upward so that the drill will come out near the center of the head; a ¼ in. drill is used. The proximal section of the long head of the biceps is then passed through this canal and re-sutured upon the distal cut end. It is possible too verlap this ½ in. Black silk is used for it. The wound is then closed in layers and the upper extremity placed in a Valpeau bandage with the elbow flexed to 45°. This is kept up for three weeks, following which the patient is encouraged to use the extremity.

*Read at Sixteenth Annual Meeting of Alumni of Hospital for Ruptured & Crippled, N. Y., Nov. 19–20, 1928.

CARCINOMA OF THE PENIS

TREATED BY THERMO-ELECTROCOAGULATION*

BUDD C. CORBUS, M.D., F.A.C.S.

CHICAGO

THE solution of the cancer problem lies in the early recognition of the disease and its adequate treatment.

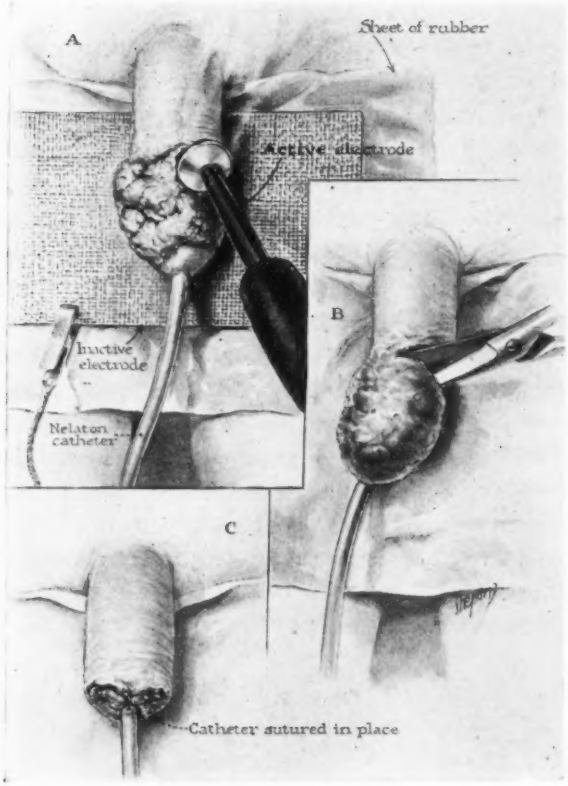

FIG. 1.

As carcinoma of the penis is often a late sequela of chronic balanitis due to phimosis, early circumcision should be encouraged. However, if there is the slightest evidence of a beginning carcinoma, circumcision should not be performed until many months after the growth has been destroyed by thermo-electrocoagulation.

With an early diagnosis and immediate and proper treatment, the prognosis is excellent. In late diagnosis, even with skillful treatment, the prognosis is fatal.

According to the best authorities under no circumstances should a section of a growth be removed for diagnosis by simple excision unless followed immediately by some form of coagulation. In order to safeguard any metastases it is preferable to remove tissue for biopsy immediately preceding the thermo-electrocoagulation.

The following technique is suggested for those advanced cases of carcinoma of the penis that have heretofore had the organ completely removed by surgical excision. While the method does not offer a cure, it removes the foul fungating mass with a minimum chance of disseminating the metastases that have already occurred, at the same time leaving a part of the penis in a normal condition. If the coagulation is complete, there will be no reoccurrence in the stump.

For the metastatic growth that has already occurred in the regional glands, either roentgen rays or thermo-electrocoagulation may be employed.

A. A heavy rubber sheet is placed over the thighs, beneath which are placed several layers of gauze moistened with water. On top of the rubber sheeting is placed the inactive electrode. The penis with a Nelaton catheter that has been passed into the bladder is layed flat on the inactive electrode. With the active button electrode the whole mass is cooked white, taking enough of the healthy tissue to insure complete destruction of the growth.

B. The method of cutting away the coagulated tissue: The margin of the incision should be kept within the coagulated tissue in order to avoid hemorrhage and should not sever the catheter. Unless the coagulation is carried to the point of escharing the catheter will not be destroyed.

C. On the stump of the penis, catheter in situ, the retention sutures should be carried through the skin. The catheter may be removed on the twelfth post-operative day.

* Submitted for publication March 1, 1929.

CASE REPORTS

MASSIVE ATELECTASIS OF THE LUNG FOLLOWING PELVIC FRACTURE*

HARRY O. VEACH, D.M.S. (HARV.), M.D.

NEW YORK

MASSIVE atelectasis of the lung has been reported frequently as a sequel of abdominal operations, chest wounds, and postdiphtheritic paralysis.[1] Relatively few cases are on record, however, in which this condition has followed simple fracture.[2] The present case belongs to the latter class, being one of pelvic fracture followed by massive atelectasis of the left lung. It also illustrates well the displacement of the mediastinal structures to the left.

F. T., a well-developed white male, thirty-two years of age, was admitted to Staten Island Hospital March 12, 1928. He had sustained an injury from a falling heavy box, and as a result he complained of pain in the left groin and the sacral region. Physical examination revealed moderate tenderness in these regions, but the skin was intact and there was no swelling nor ecchymosis. The examination otherwise was quite negative. No lesions were found in the head, neck, thorax, abdomen, or extremities.

A roentgenogram of the entire trunk was taken on admission. This showed that the lungs were of equal density, that the heart was normal in position and size, and that there were no fractures above the pelvis. The following pelvic fractures, however, were revealed: an oblique fracture through the pubic crest on the left side; a fracture through the inferior ramus of the left pubic bone at the ischiopubic junction, and a separation of a small fragment from the inferior border of the superior ramus of the left pubic bone slightly anterior to the iliopubic junction. These fractures are designated by arrows in Figure 1.

The daily progress of the case may be presented as follows:

March 12. Patient resting comfortably. Temperature at 4 P.M., 99.4°F.

March 13. Temperature at 8 A.M., 98.6°F. The patient rested comfortably till 11 A.M. when his face began to flush and his respiratory movements became labored and moderately increased in rate. His pulse and temperature rose markedly. At 12 noon, the latter was 101.0°F. and it continued to rise to its maximum of 104.2°F. at 4 P.M.

Examination of the chest at 1 P.M. showed absence of breath sounds, flatness to percussion and absence of tactile vocal fremitus on the left side below a transverse plane passing through the xiphisternum. At 3 P.M. these physical findings were elicited over the entire left side of the chest beneath a horizontal plane through the third costal cartilage.

A roentgenogram taken at 3 P.M. showed a dense shadow obscuring all lung markings in the lower two-thirds of the left side of the chest. It also showed a definite displacement of the heart and mediastinal structures to the left (Fig. 2).

The patient's leucocyte count at 9 P.M. was 12,300, there being a distinct polymorphonucleosis.

[1] Consult the following for a more extensive consideration of this subject:

a. PASTEUR, W. *Brit. J. Surg.* 1: 587–601, 1914.

b. ELLIOT, T. R., and DINGLEY, L. A. *Lancet*, 1: 1305–1309, 1914.

c. BRADFORD, SIR J. R. Oxford Medicine, II: 127–137.

d. LEE, W. E. *Ann. Surg.*, 79: 506–523, 1924.

e. JACKSON, C., and LEE, W. E. *Ann. Surg.* 82: 364–389, 1925, and *Trans. Amer. Surg. Ass'n.*, 43: 723–766, 1925.

f. SCOTT, W. J. M. *Arch. Surg.* 10: 73–116, 1925.

g. CHURCHILL, E. D. *Arch. Surg.* 11: 489–518, 1925.

[2] Cf. *a.* RIGLER, L. G. *Minnesota Med.*, 9: 326–333, 1926.

b. EDKIN, D. K. *Ann. Surg.*, 86: 885–889, 1927.

* Submitted for publication January 18, 1929.

March 14. The clinical picture remained practically unchanged till 12:30 A.M., when the patient began to cough, expectorating a thick,

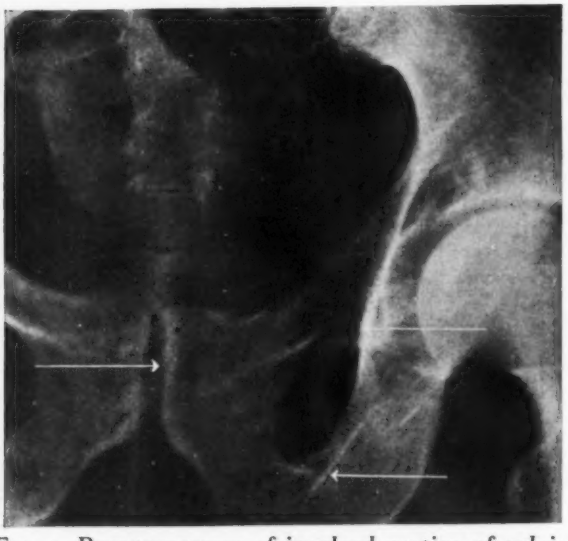

FIG. 1. Roentgenogram of involved portion of pelvis, taken March 12, 1928. Fracture positions indicated by arrows.

tenacious, greyish-white mucoid sputum. It contained no blood and was found negative for tubercle bacilli. Several hours later, breath sounds began to be audible over the lower two-thirds of the left side of the chest. Tubular breathing was heard at the angle of the left scapula and anteriorly at the base of the lung. At the same time, tactile vocal fremitus returned.

March 15. The patient continued to cough and expectorate sputum of the character described, and he was instructed to lie on his right side to facilitate drainage of the left bronchi. The breath sounds became more nearly normal over the affected region of the chest. The patient's leucocyte count was 11,200 with a definite polymorphonucleosis.

March 16. The patient continued to cough and expectorate the characteristic sputum. A second roentgenogram was taken which showed a marked decrease in the density of the shadow in the left lung, though the heart and mediastinal structures remained considerably displaced to the left. This picture also showed that the left dome of the diaphragm was somewhat elevated. (Fig. 3).

March 17. There was little change in the clinical picture, except that the temperature was showing a definite tendency to return to normal. The patient continued to cough and expectorate the characteristic sputum.

March 18. On this day, the temperature did not rise above normal. The patient coughed less and rested more comfortably than previously.

March 19. The temperature remained normal, and the pulse and respiratory rate had become, by this time, practically normal. Expectoration of the bloodless, mucoid sputum ceased.

March 20. The temperature remained normal. A roentgenogram of the chest showed that

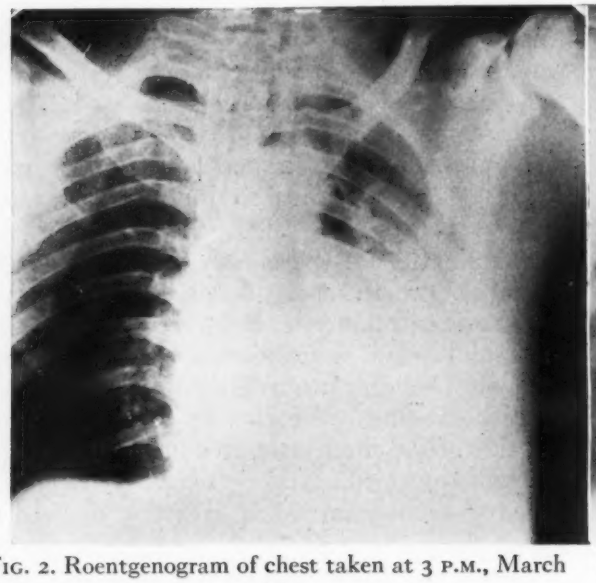

FIG. 2. Roentgenogram of chest taken at 3 P.M., March 13.

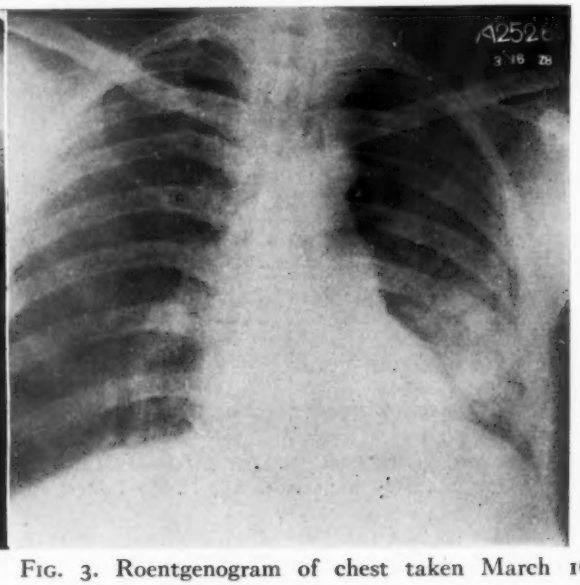

FIG. 3. Roentgenogram of chest taken March 16.

the shadow on the left side had practically disappeared and that the heart and mediastinal structures had returned almost to their normal position. Slight elevation of the left side of the diaphragm, however, still persisted (Fig. 4).

Here, then, is a case of massive atelectasis of the left lung which developed about thirty hours after fracture of the pelvis. Within twenty-four hours after the onset of this condition of atelectasis, it began to resolve, the patient expectorating probably from 30 to 50 c.c. in all of mucoid, bloodless sputum. Resolution was progressive, with the result that the temperature had returned to normal five days after the onset of the atelectasis, and the chest had returned practically to normal seven days after its onset. Postural treatment was employed, the patient being instructed to lie on his unaffected right side and to cough freely.

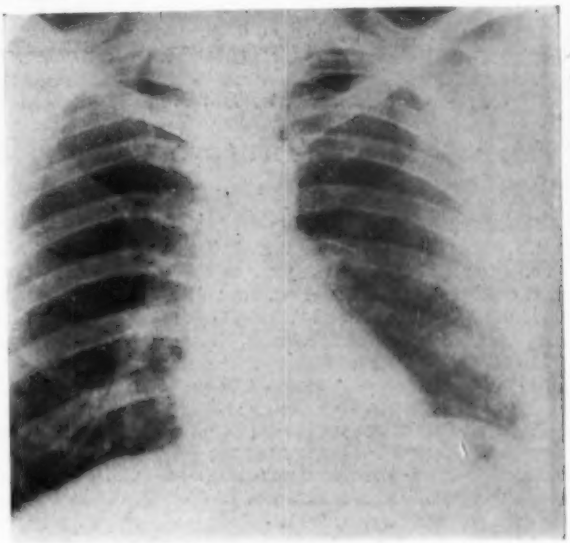

Fig. 4. Roentgenogram of chest taken March 20.

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EDITORIAL

WHAT'S IN A NAME?

J. EASTMAN SHEEHAN, M.D., F.A.C.S.

NEW YORK

EVERY now and again one is made aware that there exists, even amongst those who ought to know better, an entirely wrong idea of what plastic surgery is. It gives one a curious sensation, after going through with three or four operations in a morning, any one of which may make serious demands upon the skill, knowledge and experience of a surgeon, to find in the conversation of some respected colleague a reflection of his inner conviction that the whole business is only an extension of the work done in the beauty parlor. After one gets accustomed to this he ceases to be annoyed by it, for the mental process is readily discernible. "The beauty parlor advertises plastic surgery; the Post-Graduate Hospital has a plastic surgery department; things which are equal to the same thing are equal to one another; therefore a plastic surgeon is a beauty doctor, which was to be proved." It is much as though one were to say, "Barbers were the first surgeons; in some countries the tradition of barber-surgeon remains, so that a surgeon does not call himself a doctor; therefore all surgeons are barbers." Nothing could be simpler. No doubt the confusion is due mainly to the fact that more people read the newspapers than the dictionary, for there the definition is entirely accurate, plastic surgery being described as that which has to do with molding, modeling, renewing lost parts and rectifying deformed parts of the body, with restoring and healing where there are such deformities. If people will insist that it means nothing but face-lifting, what can be done about it? Even

if one gets to calling it reparative or reconstructive surgery, with some notion of making a concession to the mistaken mood of others, the chances are that these latter are not in the least impressed. They do not want to change their opinion, a common enough human trait even with those who have had medical training.

But as to what the fact is, supposing the truth to be of some importance to minds not sealed against it, perhaps something will appear from the following list of operations, performed in the mornings of one month in this present year in the department of Plastic Surgery at the Post-Graduate Hospital:

Severe burn of face; making of new eyelid. Repair of syphilitic nose of the second order. Excision of basal-cell carcinoma of nose; to be repaired later. Basal-cell carcinoma of orbit. Severe burn of chin and neck. Removal of large keloids from arm. Fractures of superior maxilla and of nasal bones. Carcinoma of floor of mouth. Empyema of antrum; skin grafting. Severe ectropion of upper and lower lids; graft from other lid. Reconstruction of nose after motor accident; 2 cases. Closure of sinus posterior to ear. So-called "inoperable" cleft palate; 2 cases. Hare lip; 3 cases. Repair three years after excision of cancer from floor of the mouth. Bone graft to jaw. Repair twenty years after tracheotomy. Keloid scars on face and neck. Paraffinoma of nose and cheek. Replacement of nose; total loss from lupus and syphilis. Restoration after total loss of ear. Roentgen-ray burns; 2 cases. Radium burn. Severe fire burns; 3 cases. Unilateral facial paralysis. Cancer of larynx. Depression from scleroderma. Restoration of orbit, after motor accident. Ear, cheek and nose lacerated by wind shield. Trismus of jaw. Cancer following radium treatment for removal of port-wine stain. Intractable scars after tonsillectomy. Adherence of palate to pharynx; syphilitic. Several cases of nasal disfigurement from various causes, in which distortion of the parts involved limitation of function.

It will hardly be contested that such a series calls for a knowledge and practice of surgery of an order not to be despised. There is nothing in the whole list that the so-called "beauty doctor" would consider to be within his province, or that he would venture to grapple with.

What is true is that, underlying all this range of surgery, which might be expanded almost without limit, there is a certain simplicity. One learns that the Thiersch graft has the quality of dependability. Then, when confronted with a problem, perhaps entirely new, one asks whether the Thiersch graft is likely to serve the immediate purpose. Will it do to replace the burn scar at the axilla by which an arm is immobilized? It will; and when it has done so the function is restored. Will it serve for a new lining of the antrum? It will; and there is an end of all those disgusting excretions. Will it serve to make a new lachrymal duct? It will; and again function has been restored and a great annoyance has been removed. There is nothing too small for it, nothing too large; one can take from the skin surface, practically without discomfort to the patient and with almost no bleeding sufficient to cover any defect encountered in practice. This one translucent shaving of skin is the key to success in a vast and continually expanding range of surgery.

Similarly with the Wolfe graft; once it has been made reasonably certain, and the efficiency is now better than 90 per cent, that the full-thickness skin graft will live under known pressures, one can proceed with excisions of a size that could not before have been covered. One can take away the skin that has been exposed to the ravages of lupus, or syphilis, and with all confidence set about replacing it.

Or consider the potential of the pedicle graft, which can be used where it is freed or can be migrated from the abdomen to the face. If one is certain of its efficacy, one does not shrink from taking away the whole side of the face, if necessary, confident that replacement by this method will repair the loss. Both the Wolfe and the tubed pedicle are factors of the highest efficiency in the surgery of cancer, and if the recent intensive development of plastic

or reparative surgery had done nothing else than to produce the confidence with which, because of the demonstrated capacities of these grafts, one approaches these cancer problems, plastic surgery would have justified its existence. It is probably true of this, as of most other new ventures, that those who were present at the beginnings did not foresee a tenth of its possibilities of expansion. The inventor of the steam engine had no conception of the uses that were to be made of it; Bell did not foresee the expansion of the telephone; Marconi did not vision the radio receiver in every home. These expansions flowed from the simplicity of their beginnings. It is the same here; each new day proves that the underlying principle, based on the practicability of transferring tissues from one part of the body to another part of the same body, is applicable to some condition met with in civil life that was never thought of when the surgeons in the war hospitals were adapting, as emergency measures, those procedures which had been elaborated by Szymanowski and others long before but in such obscurity that but for the books they wrote the memory of their patient labors would have been lost.

For example, when Szymanowski wrote there was no radium and there were no roentgen rays. In our day we not only have these but we have to reckon with the burns they leave, the scars that are produced by their use, the tissues devitalized by their employment, the dysfunction that results, and the malignancy that threatens. It is not too much to say that, where these potent agencies have passed beyond the control of those who used them, and the sequelae mentioned have developed, practically the only relief to be had is that which reparative surgery can give. The number of instances in which such intervention has been effective probably is not even suspected even by those who are abreast of the times; certainly not by those who have failed to sense the true meaning of this latest surgical specialty.

Considering that in the delicate surgery required in the orbital area the principle of transplantation has been recognized and highly developed, it is perhaps a little odd that the possibilities of transplantation as applied to more extensive areas were not recognized long before they were. Indeed, even in this field, until recently, it seemed as though limits had been set to surgical imagination. The Thiersch graft is now used not alone to cover defects on the lids, in certain conditions, but has proved to be the only physiologically acceptable lining for a socket from which the eye has been extruded. Again, the repair of an eyelid by transfer of a graft from a sound upper lid, on all counts the best and most satisfactory method in many instances, owes its introduction rather to reparative than to ocular surgery. And the employment of these same eyelid skin grafts to cover small facial defects, the grafts matching more perfectly than any other the skin surroundings in which they are placed, is a method likewise evolved in the plastic surgery clinic. Once the problems of the restoration to life of the transplanted full-thickness graft had been mastered, it was inevitable that attention should be directed to the possibilities inherent in the eyelid skin, the thinnest to be found on the body; which can be spared (from the upper lid) without injury, in quantities greater than anyone would have suspected; and which "takes" practically 100 per cent.

At the other extreme, from the viewpoint of severity of intervention, may be cited the taking of fascia lata from the thigh, or of cartilage from the costal crest, neither, of course, more serious than the removal of bone for purposes of transplant but both involving surgical concepts less familiar in experience. It is only lately that anyone has thought of unilateral facial paralysis as a problem to be associated with the tensile properties of fascia. There may be those who, once the possibility of nerve anastomosis has been rejected, decline to admit that the disfigurement resulting

from the overbalance of muscles is worthy of a surgeon's consideration, but even these must concede that the dysfunction which at times is incidental to the condition does command attention. In either case, the position is dominated by the fact that fascia, carried in strips under the skin and even through the subjacent tissues, will live in its new environment and will respond to the strain required of it.

The cartilages also come into the picture and cannot be ruled out of it. One may be callous enough to hold that if a fellow human is unfortunate enough to have the constituents of his nose distorted he should be content to go through life sorry for himself and not be granted any surgical aid to betterment; but if these distortions are productive of entire or partial closure of the airway, as so often happens, the threat to the general health is universally admitted to be of such importance that the best efforts of the surgeon are not merely justified but commanded. Now it happens that, in part, the support of the nose is maintained by the presence of cartilage; it has been so ordained by nature that the presence of cartilage is essential to some of the nasal functions. If it is absent from where it is needed the loss must be made good. Not until very recently has it been recognized that there may be enough material for the actual purpose to be obtained from the excess of lower lateral cartilages occasioned by the hypertrophy that follows trauma too long neglected.[3] If this resource is unavailable, or insufficiently, then there is nothing for it but to invade the costal crest, the ultimate justification for that insult being that the cartilage not only supports the bridge but lives, thrives and is accepted in its new situation, where any and every foreign body that might afford support is doomed to expulsion, with all the attendant details of inflammation, abscess, and perhaps infection.

Certainly those who make light of this order of surgery are out of court when confronted with the consequences of surgical error. There is, for example, a well defined type of nasal disfigurement which is to be traced to resection of the septum without allowing sufficiently for the strength demanded of the supporting buttress that remains. The patient owes to this error a simulated hump at the nasal bones, a depression at the cartilagenous bridge, a retracted columella, a drooping nose tip, and impaired breathing. There are, again, after tonsillectomy, instances in which essential muscles of the pharynx are found to have been immobilized, either by direct injury or by cicatrices. Besides the discomfort, there may be definite impairment of voice production. Were it not for the certain knowledge that, after the incidental surgery, difficult in the very nature of the circumstances, a Thiersch graft here and perhaps a mucous membrane graft there will free the area from the danger of later constriction, the errors which produced the condition would be irremediable, the suffering of the surgeon in his self esteem being added to the suffering of the patient in his person. Still another interesting development is to be noted in the mentioned cases of "inoperable" cleft palate. Here, after the tissues commonly utilised have ceased, after several failures, to afford a further supply, reparative surgery addresses its attention to the tonsillar tissues, from which a soft palate can be formed, paving the way for articulation in voice production.

It will be noted that in the list of cases cited for a single month, and that a month in which motor traffic is, probably, at its nadir, there were instances of wind shield injuries. These, a part of our ultra-modern civilization, have become both frequent and characteristic. There is a shearing, with variable loss, beginning at the ear and carried through to the nose and chin. The esthetic impairment is noteworthy. Is there any use telling the patient that it is unethical to try to replace what has been lost from his ear or his nose? If a boy is born without an ear, and one can be

made for him from his own tissues, who is to say he must go through life depressed by the consciousness of his deformity?

Enough has been said to indicate that, once mastery has been attained of the relatively few essential details of replacement by transplant, the field for their effective utilisation continuously and progressively expands. There is scarcely any limitation in either the number or the variety of cases; one is continually impressed by the volume of such ills, not in war conditions, where one expects them, but in the ordinary run of civil life, where one does not. Burns and explosions; trauma of all kinds and their sequelae; deformities congenital and acquired; dysfunction of various origin; sequelae of surgical error; disfiguring sequelae of disease; losses incidental to syphilis and lupus; and at the end of the road, cancer and the covering of defects incidental to the surgery to which it gives occasion; these are all parts of the problem presented, day in and day out, year's end to year's end. There seems to be no limit to what might be attempted, nor yet to the employment of what knowledge a surgeon may have attained, of any boldness with which he is gifted, of any skill he may have acquired. The test, if I may be allowed to predicate upon a single experience, is that, while there is a thrill in every instance and each case is different, in some particular, from every other, the inevitable drift, with every operator, is towards the alleviation of cancer. The whole arsenal, with every improvement that experience and practice can make to it, is envisaged, consciously or subconsciously, as contributory to this great end. Can more be said for any branch of surgery?

THE SAMUEL D. GROSS PRIZE

FIFTEEN HUNDRED DOLLARS

Essays will be received in competition for the prize until January 1, 1930

The conditions annexed by the testator are that the prize "shall be awarded every five years to the writer of the best original essay, not exceeding one hundred and fifty printed pages, octavo, in length, illustrative of some subject in Surgical Pathology or Surgical Practice founded upon original investigations, the candidates for the prize to be Americans citizens."

It is expressly stipulated that the competitor who receives the prize shall publish his essay in book form, and that he shall deposit one copy of the work in the Samuel D. Gross Library of the Philadelphia Academy of Surgery, and that on the title page it shall be stated that to the essay was awarded the Samuel D. Gross Prize of the Philadelphia Academy of Surgery.

The essays which must be written by a single author in the English language, should be sent to the "Trustees of the Samuel D. Gross Prize of the Philadelphia Academy of Surgery, care of the College of Physicians, 19 S. 22d St., Philadelphia," on or before January 1, 1930.

Each essay must be typewritten, distinguished by a motto, and accompanied by a sealed envelop bearing the same motto, containing the name and address of the writer. No envelope will be opened except that which accompanies the successful essay.

The committee will return the unsuccessful essays if reclaimed by their respective writers, or their agents, within one year.

The committee reserves the right to make no award if the essays submitted are not considered worthy of the prize.

William J. Taylor, M.D.,
John H. Jopson, M.D.,
Edward B. Hodge, M.D.,
Trustees.

Philadelphia, May 20, 1929

Subscribers to The American Journal of Surgery *visiting New York City are invited to make the office of the publishers (Paul B. Hoeber, Inc., 76 Fifth Avenue, New York) their headquarters. Mail, packages or bundles may be addressed in our care. Hotel reservations will gladly be made for those advising us in advance; kindly notify us in detail as to requirements and prices. List of operations in New York hospitals on file in our office daily.*

ANTONIO SCARPA

[1747-1832]

SCARPA'S TRIANGLE

ANTONIO Scarpa was born in 1747 and died 1832.

Physicians will remember meeting his name as students in their freshman or sophomore year anatomy course. One of the questions frequently asked an undergraduate is: "Bound Scarpa's triangle." Later in life as mature surgeons this triangle plays a routine part in certain operations.

Scarpa was a many-sided individual. He was a writer of note. He carried on independent investigations and made noteworthy discoveries. He was a great anatomist and also as a surgeon won renown in his day. As a surgeon he was skilled in several departments of this branch of medicine. He was exceptionally skillful as an orthopedist and an ophthomologist. To him is given the credit for the discovery of the membranous labyrinth, the nasopalatine nerve, and the triangle of the thigh which bears his name. He was the first to declare that arteriosclerosis is a lesion of the inner coats of the arteries.

As a writer he covered many subjects. He wrote a worthwhile book on hernia and eye diseases. He originated the procedure of iridodialysis. He devised and made a shoe for club-foot which is still sometimes used, more or less modified, by orthopedists. His greatest work was the "Tabulae Nevrologicae" (Pavia, 1794). In this for the first time is given the proper delineation of the nerves of the heart.

We read that Scarpa was "an irreproachable Latinist, a master of sarcasm, yet a most attractive teacher and a draughtsman of the first order" (Garrison).

He comes down the years as one of the few medical men who have illustrated their own books. His artistic skill was of the highest order. As an artist his fame would have endured the centuries. He trained Faustino Anderloni to execute the copper engravings from his drawings (Choulant). We quote from that student and expert of medical history, Garrison: "Scarpa's illustrations are the crown and flower of achievement in anatomic pen-drawing, while Anderloni's wonderful copper-plates of the same are comparable in *brio* with the work of Sharp, the Drevets, and other masters of the best period of line engraving."

After living a full life, a life of diversified vocations and avocations and interests, he died at the ripe age of eighty-five years.

T. S. W.

[From Fernelius' Universa Medicina, Geneva, 1679.]

BOOKSHELF BROWSING

THE INFLUENCE OF THE BRITISH MASTERS ON AMERICAN SURGERY*

ANDREW STEWART LOBINGIER, M.D., F.A.C.S.

LOS ANGELES

THE development of the science of surgery out of the inchoate practices of the barber surgeons forms a chronicle of the most dramatic interest.

The Hippocratean principles of the art of healing had slumbered for centuries in the abysmal gloom of monastic ignorance and superstition. The channels for the dissemination of intelligence were few and those which functioned were hedged about with formalities and impedimenta which dwarfed all consistent efforts toward literary and scientific progress.

When printing was invented in the fifteenth century an amazing change spread over the world's civilization. Through the medium of the printed page the knowledge of progress in science and art could now be widely disseminated. The record of invention and discovery could be published to a world now eager for learning and knowledge. The dawn of a renaissance of science and discovery, of letters and of art, which reached its zenith in Britain in the glorious Elizabethan epoch, has no counterpart in history since Greece's Golden Age of Pericles.

Into this radiant atmosphere of England's flowering splendor was born a boy whose original mind and genius for research soon placed him in the foremost rank in the study of the phenomena of life and function. William Harvey's discovery of the circulation of the blood and the physiology of generation were not only epochal; they served to establish for the first time in the history of medicine the fundamental basis for all subsequent anatomic and physiologic research and of all subsequent development in pathology and in surgical science.

There shines about the name and fame of Harvey a luster which the lapse of time has only served to render more significant and enduring. He lived and worked amid the companionship of England's most learned men in science and letters, the product of whose rich and resourceful minds constitute today the world's richest treasures in literature and art. His father-in-law, Dr. Lancelot Browne, had been Elizabeth's physician and as Harvey rose in favor he became himself the companion of princes and later physician and companion in travel of James I. Later still he held the same intimate association with Charles I, who was so ardent in his admiration of Harvey and his discoveries that he

*President's Address. Read before the Pacific Coast Surgical Association, Santa Barbara, Calif., Feb. 22–23, 1929.

proved to be his most faithful friend and supporter. We know that he was friend and physician of the Duke of Lennox, of Lord Bacon and the Earl of Arundel and he must have known Shakespeare, who doubtless had intimate knowledge of Harvey's discoveries when he wrote: "The ruddy drops that visit my sad heart."

The early masters in Britain were among the first to formulate the study of anatomy and physiology into a system of correlated structure and function. There was a directness of approach in these studies which distinguished them from all other schools of scientific investigation. The celebrated schools of anatomy of William Hunter in London and of Charles Bell in Edinburgh were the direct result of this system of organized research. William Hunter, Percival Pott, John Hunter, the Monros, John and Charles Bell and Sir Astley Cooper composed a brilliant succession of masters and pupils, later to become teachers, whose influence and renown extended to three continents.

America especially benefitted by the instruction which our visiting students of medicine received at the hands of these British instructors. Once their fame reached our country, ambitious young medical students, who could afford the undertaking, braved the perils of the Atlantic, eager for the instruction in anatomy, physiology and surgery offered them in the schools of London, Glasgow and Edinburgh.

One of the first and most ardent of these young students was John Jones, who became a pupil of William Hunter in his school of anatomy and of Percival Pott in St. Bartholomew's Hospital. He was born in 1729 and died in 1791. He first studied medicine with Dr. Cadwalader in Philadelphia. Later he went to London to be with Hunter and Pott and afterwards visited the clinics of Petit, Le Dran and Le Cat et the Hôtel Dieu. In 1757 he took his degree in Medicine at the University of Rheims. Returning to America he opened offices in New York in 1753 and later returned to Paris.

While in London he was contemporary with John Hunter and while a student of his brother William became a skilful anatomist and formed a taste for operative surgery. He later returned to America, qualified to take a high place as a surgeon. Ten years after he had taken his degree at the University of Rheims he was made Professor of surgery in the Medical Department of King's College, just opened for instruction. He was the first American to be given a professorship in surgery. His biographer said of him: "He was well fitted by education and his various accomplishments to become the instructor of others; not merely as the skilful operator, but as the scientific surgeon and as the first teacher of surgery in the colonies, he justly deserves to be styled the Father of American Surgery."

Another of the early students of surgery to attain international fame was John Warren (1753–1815). He was a younger brother of General Joseph Warren, also a surgeon, who fell at Bunker Hill. Like his brother with whom he studied medicine, he became an ardent patriot and was at Concord and the first battle of Lexington. In 1780 Dr. Warren gave a course of lectures on anatomy with dissections at the Military Hospital. The following year the students at Harvard were permitted to attend his lectures. This lecture course finally led to the founding of the Medical Department in Harvard in 1783.

There were now three Medical Colleges of character in America: The Medical College of Philadelphia which became the Medical Department of the University of Pennsylvania in 1791; the Medical Department of King's College in New York which became the Medical Department of Columbia College in 1784, later in 1810 the College of Physicians and Surgeons; and the Medical Department of Harvard University. The leading spirits in the founding of these three great medical schools, which have had such an important part in the development of medical education in America, were almost all of them stu-

dents of the master anatomists and surgeons of London and Edinburgh.

In the beginning instruction in surgery was combined with the chairs of anatomy, chemistry and obstetrics. From now on these students of the British teachers demanded a distinctive place for surgery in the curriculum. Stephen Smith says: "This change in the system of surgical education was due to the genius of John Hunter, whose researches in the latter half of the eighteenth century gave to surgery the character, dignity and responsibility of a true science." While the teaching of the British scientists made slow progress in the schools of Europe on account of national prejudices and jealousies, they early took deep and abiding root in the virgin and fertile soil which the young and plastic schools of America afforded and through which they were to mould the character of its future surgeons. It was a fortunate circumstance that a corps of American students appeared at this critical time in the history of surgery in this country, thoroughly qualified by temperament and education to become the propagators of the principles and practice of the new faith through these pioneer schools."

It is quite impossible within the time limit of this address to consider with any degree of just appraisal the men whose avid desire for learning and superior endowments as teachers of surgery lent a singular distinction to their labors in our American Medical Colleges. Amongst the most celebrated of these teachers were:

Dr. Wright Post (1766–1828) who prepared for his medical study in the offices of Richard Bayley in New York. In 1784 he became a pupil of Mr. Sheldon in London and was an ardent follower of John Hunter's teaching and probably saw Hunter do his first ligation of the femoral artery for aneurysm. Later he returned to New York where he became professor of surgery in the Medical Department of Columbia University. He was the first professor of surgery in the College of Physicians and Surgeons and became president of the College in 1821 and continued in this office until 1826. Valentine Mott, one of his most devoted pupils, said: "He was unrivalled as an anatomist, a most beautiful dissector and one of the most luminous and perspicuous teachers I have ever listened to either at home or abroad."

In 1767 Valentine Mott (1785–1865) was given the chair of surgery in the College of Physicians and Surgeons, which was now raised to a full and independent professorship. At nineteen he entered the office of Dr. Valentine Seaman. He continued under the preceptorship of Dr. Seaman until his graduation from the Medical Department of Columbia in 1807. Dr. Wright Post was his professor of surgery. Soon following his graduation Dr. Mott visited London to become the pupil of Sir Astley Cooper. He also attended the lectures and clinics of Cline, Abernaethy, Blizzard and Home. He remained in London two years as Sir Astley Cooper's assistant in surgery. He returned to New York in 1809 and offered a course of lectures on operative surgery on the cadaver. The following year he was appointed professor of Surgery in Columbia on the advice of his former preceptor, Dr. Wright Post. He continued to hold the chair of surgery until 1826. Later he was professor of surgery at Rutgers College and later in the Medical Department of the University of New York. He was rated as a superior teacher and clinical surgeon, versatile in his learning and an educator of the highest character. He had been trained at home under his preceptor Wright Post, in the principles of John Hunter; abroad he had had a splendid training under Home, Abernathy and Cooper.

Alexander H. Stevens (1789–1869) followed Mott at the College of Physicians and Surgeons. A graduate of the University of Pennsylvania in 1811 he had the fine training in surgery from Philip S. Physick, who had had exceptional training in experimental work with John Hunter.

Willard Parker (1800–1884) succeeded Professor Stevens and was made professor of surgery in 1840. He was a graduate of Harvard and a pupil of Dr. John C. Warren. "Thus it happened that the chair of surgery once occupied by Jones and Post, then made illustrious by Mott, one of his own pupils, was next filled by a representative of Physick, and now was to be given to a student of Warren." Parker was one of the finest and most original clinical teachers of surgery of his generation. It was common remark that he was among the first to adopt the bedside clinic to the theory of practice. He held this chair for thirty years and it is probable no surgeon in New York ever surpassed him as a clinical teacher, or equalled him in the inspiration for critical surgical analysis which he was able to convey to his admiring students.

In addition to this galaxy of master surgeons whose constructive work as teachers and organizers of systematic surgical study in the cities of New York and Boston there were those of the University of Pennsylvania equally celebrated in the city of Philadelphia. Philip Physick (1768–1837) was one of them. His long and intimate association with John Hunter had given him a prestige amongst his colleagues which was immediate and enduring. He had lived in Hunter's house as a member of his family and became so great a favorite, that at the end of his residence with him, Hunter asked him to become his partner. But he went on to Edinburgh where in 1792 he received his medical degree when only twenty-four. Returning to Philadelphia he was appointed surgeon to the Pennsylvania Hospital and in 1800 was given a lectureship in surgery. In 1805 the professorship in surgery was created and Dr. Physick was made professor. He occupied the chair of surgery for thirteen years and gave rare distinction to the systematic teaching of general surgery as an organized science.

Dr. William Gibson (1788–1868), who succeeded Physick, ably maintained the high reputation which the arduous labors of his distinguished predecessor had given the department of surgery. Gibson was one of Princeton's fine scholars and after his graduation there he went to Edinburgh to be with John and Charles Bell. He took his medical degree from the University of Edinburgh; his graduating thesis was on the subject of "Necrosis" and was so fine it gave him instant distinction. On his return to America he was given the chair of surgery in the University of Maryland and in 1819 succeeded Physick as professor of surgery in the University of Pennsylvania.

In addition to these great surgeons whose training was directly derived from Home, Abernethy, Hunter and Cooper, were Bigelow of Boston, Gross and Agnew of Philadelphia, James R. Wood of New York, Donald Maclean of Detroit and Ann Arbor, who was for many years James Syme's first assistant, and Moses Gunn of Chicago. These men were directly or indirectly influenced by the early British masters, of whom John Hunter was their ideal, and by Joseph Lister with whom most of them were contemporary.

They were clever anatomists and some of them, inspired by the epochal work of Lister in pathology and bacteriology, became devoted disciples of this great teacher in the early adoption of the principles of antiseptic and aseptic surgery. For it must not be forgotten that Lister was the first to suggest and put in practice asepsis, as he had been the first to detail the principles of antisepsis.

The Senior Fellows of this association will recall with me the steam atomizer used in the operating ampitheatre in the early 80's and the phenolized fog which blinded us as we tried vainly to gaze through the choking fumes. Fortunately this method of rendering the atmosphere of the operating room sterile soon gave way to the aseptic technique in the preparation of instruments, dressings and everything which contacted the field of operation;

and by 1890 we had established an aseptic technique so meticulous in its detail that it never has been surpassed and now, after forty years, is scarcely equalled in the modern operating room. But it must not be forgotten, that, however great the obligation to Hunter Bell, Pott and Cooper, great anatomists and physiologists in their day (great constructive mentalities in establishing the art and science of surgery in the English speaking world) equally great is our debt to those who followed them and perfected the science which the early masters so vaguely outlined. For in Lister, Macewen and Horsley (and although still living, we should like to add Mayo-Robson) Britain gave to America and the whole world, not only the creative geniuses who made possible the perfected art we now enjoy, but with a dramatic and episodic flare, unexampled in the annals of science, gave to our guild the very highest development in the domain of specialized surgery. They were the first to approach the great problems of surgical pathology with the uncompromising analysis which made possible its interpretation in terms of a definite surgical remedy. They studied the function and minute anatomy of various organs both as discrete entities and in their correlated reactions with other organs contiguous to them. Their discoveries revealed the importance of bacterial infection both local and disseminated and they established the fundamental laws which govern surgical procedure in the complicated pathology of a disseminated infection. Through them and their incomparable labors the art of surgery has approached the state of a perfected science. By their modest, untiring but courageous, and at times revolutionary efforts they have left a legacy of scientific accomplishments whose luster will never fade.

So much has been said of late in the anniversary biographic reviews of the lives and works of John Hunter and of Lord Lister that it would seem improper to review their epochal work again. One writer has recently said: "The history of surgery can, in fact, be divided into two periods—before Lister and after Lister." But Lister had an admiring colleague, who, like Lister, was a great pathologist and a still more accomplished physiologist. No review of the work of the master minds in British surgery would fail to pause before this luminous figure, the most modest and withal the most outstanding in stellar brilliance in the history of surgery. Victor Horsley's fame, to those who knew indirectly of his life of vast research, eminated from his work in localization and surgery of the brain and cord. And while that was where his creative faculties had their finest expression, he was, in fact, equally great in his work in physiology, pathology and the general field of surgical research.

It is true he has been known in America chiefly for his epochal studies in localization of the centers of the brain and his rare genius in brain surgery. But he distinguished himself also in his original work on the thyroid gland and his notable studies in confirmation of the work of Pasteur in rabies.

In 1880 at the age of twenty-three he became fellow of the Royal College of Surgeons. In 1884 at the age of twenty-seven he was appointed Professor Superintendent of the Brown Institution and began his notable work with Professor Schafer and Dr. Beevor. He discovered the nerve distribution to the major nerves, the "nervi-nervorum," by a special method of staining. At the Brown Institution, where he was Professor Superintendent for six years, he followed three lines of research: (1) the localization of function in the brain and the pathology of epilepsy and canine chorea; (2) the thyroid gland with special reference to cretinism and myxedema; (3) the protective treatment against rabies.

On April 4, 1883, Dr. Theodor Kocher gave an address at the Twelfth Congress of the German Surgical Association on "The Extirpation of Goiter and Its Conse-

quences," which was published in *Langenbeck's Archives*. He called the condition found in these cases "Cachexia Strumipriva." During April and June, 1883, the Reverdins published in the *Revue de la Suisse Romande* their "Note sur vingt-deux operations de goitre." They were acquainted with the British reports on myxedema and considered the *rapprochement complet* between the English cases of myxedema and their own cases of *myxoedeme opératoire*.

On November 23, 1883 at a meeting of the Clinical Society of London, Sir Felix Semon, calling attention to Theodor Kocher's observations, declared his belief that "cretinism, myxedema and cachexia strumipriva were closely allied conditions in which there was either complete degeneration or absence of the thyroid gland." On December 14, the Clinical Society appointed a committee to investigate this subject of which Ord, Hadden and Horsley were members. Recognizing what they called "the hitherto undreamed-of importance of the thyroid gland" they selected Horsley to study the subject by experimental physiology. He began his work in Professor Schafer's laboratory in the autumn of 1884. The report of the Investigation Committee was not published, however, until 1888. It contained 215 pages and is everywhere accepted as the first authentic experimental study of the thyroid gland.

On February 8, 1890 Horsley published his "Note on a possible means of arresting the progress of myxedema, cachexia strumpriva and allied diseases." He considers the work of Professor Schiff, published in 1884 in the *Revue de la Suisse Romande* and of von Eisselsberg on the transplantation of normal thyroid tissue in the body of a patient suffering from myxedema, and recommends this procedure which had been attempted by Kocher in 1883 unsuccessfully and again by the same surgeon successfully in 1889.

In the *British Medical Journal* of October 29, 1882, Fox of Plymouth and Hector Mackenzie published their papers on feeding fresh thyroid and the dry extract by mouth. During 1893 a large number of cases were reported, aiding the experimental work and clinical study of the thyroid. Horsley does not stand alone but, in the words of Paget, "It was he who founded in this country (England) the modern study of the thyroid gland; and it was he who first in this country suggested the rational method of treatment. Those of his profession who remember the years of ignorance and the wonder and delight of the new learning, are not likely to forget what he did in 1884–86 for science and in 1890 for practice."

The work of Horsley on the prevention of rabies in England was not less romantically epochal than his research work on the thyroid gland. Pasteur treated his first patient for rabies on July 6, 1885. In April, 1886 a commission composed of outstanding men in England was appointed by the British Government to visit Pasteur and learn of his method of treating rabies. The distinguished names on this commission is an index of the importance attached to this investigation by Great Britain. They were Sir James Paget, chairman, Lord Lister, Sir Lauder Brunton, Sir Richard Quain, Sir Henry Roscoe, Sir John Burdon Sanderson, Dr. George Fleming and Victor Horsley, Horsley was secretary of the Commission.

Sir James Paget wrote a letter to Pasteur telling of the appointment of the Commission and desiring to arrange an audience. This letter was borne in person by Sir John Burdon Sanderson. Brunton, Roscue and Horsley followed a few days later to Paris. They wanted to bear back with them an infected spinal cord and an inoculated rabbit to prove Pasteur's claims.

Pasteur proved difficult at first, but Horsley's grace and tact finally won the desired material. A number of cases were placed at the disposal of the Commission for study. Horsley returned early in May to London after seeing over 100 cases in Paris and in various parts of France to

which Pasteur referred him. Horsley's biographer found amongst his papers twenty-six letters written to him by Pasteur between May, 1886, and July, 1887.

The report of the Commission says that "Horsley's experiments begun in May, 1886 entirely confirm M. Pasteur's discovery of a method by which animals may be protected from the infection of rabies." It would be difficult to overestimate the importance of the discovery whether for its practical utility or for its application in general pathology.

The conduct of the experimental studies on rabies was greatly facilitated by the appointments at the Brown Institution where Horsley was superintendent and where he continued these experimental investigations. They were all brilliantly confirmatory of Pasteur's claims. During this year there was a startling outbreak of rabies amongst the herds of deer in Richmond Park. By April 1887, 160 deer out of the herds of 1200 had died of this disease. Before the disease had been checked 264 deer had died of rabies. Horsley conducted inoculation tests at the Brown Institution throughout the epidemic, abundantly confirming all cases studied.

A bill requiring dog owners to muzzle their dogs for a certain period of quarantine passed the House and became a law. But as was and has been true of every scientific advance in preventive medicine the enforcement met the same fanatical resistance which has characterized the anti-vaccinationists since Jenner's day. Horsley considered hydrophobia the most terrible in its terminal expression of any disease of which he had knowledge and felt it his professional obligation to give its study his most earnest and devoted labor. He was the greatest and most distinguished advocate and friend Pasteur ever had in the establishing and promulgation of his priceless discovery.

Because of his outstanding and original investigations in cerebral localization Victor Horsley became easily the first authority in the world in the diagnosis of intracranial pathology. It followed naturally from his long and strict training in experimental physiology, reports of which, in collaboration with Schafer, Beevor, Semon and Ferrier, were made before the Royal Society, that he should elect the surgery of the brain and cord as the field in which he could work with the greatest facility. So widely was this leadership accepted that a senior surgical service was created for him in the Queen's Square Hospital.

It was there on May 25, 1886 that he did his first definitely planned operation on the brain. It was the excision of a scar following a crushing accident with loss of brain substance occurring several years before. It was a classical case of Jacksonian epilepsy. Horsley removed the scar and some of the brain substance contiguous to it and the patient recovered with improved mental condition and freedom from his convulsions. Hughlings Jackson was present at this operation.

On June 9, 1887, he removed a tumor from the spinal cord, the first operation of its kind in the history of surgery. It was a patient of Gower's and was reported by Gower and Horsley in the *Transactions of the Royal Medical and Chirurgical Society*. On March 5, 1888 at a meeting of the Medical Society of London, Horsley and Ferrier reported a case of cerebral abscess operated on with complete recovery on December 10, 1887, and in this meeting referred in his discussion to a case of septic thrombosis operated on by ligating the internal jugular vein and removing the infected clot from the sinus. This operation was done early in 1886 and was the first of its kind. It was reported on May 28 before the London Clinical Society in a paper by Horsley, "On a case of suppuration of the mastoid cells with remarks on the prevention of septic embolism in such cases."

In January, 1887 Horsley did the first trephine operation ever reported for relief

of the intracranial pressure in a patient suffering from an inoperable brain tumor. This procedure was done for the relief of pain, vomiting and optic neuritis. Cushing later designated this palliative measure as "decompression." In June, 1890 he read a paper prepared from experimental data which he and Spencer gathered from their work in the Brown Institution "On the changes produced in the circulation and respiration by increase of the intracranial pressure or tension."

At the August meeting of the International Medical Congress in Berlin he reported his work on the physiology of the brain and its function in collaboration with Schafer, Beevor and Semon. His demonstrations were before a large and distinguished assemblage of physiologists and surgeons from all parts of the world, critical to a degree; but before he was through with his brilliant and startling demonstrations they acclaimed him with the highest honors.

It would be impossible to enumerate the vast collection of original scientific data which every year, with increasing abundance, distinguished the untiring labors of this greatest of England's master surgeons. The accuracy, originality and brilliantly suggestive character of his work was enthusiastically acknowledged throughout the scientific world. His laboratory and clinics were crowded with those seeking to learn these new and priceless facts in neurologic physiology and surgery. No one in his generation could approach him in productive effort nor keep up with the pace with which his great mind solved those delicate and abstruse problems of the human brain and cord. He wore out and left behind every assistant who ever attempted to keep up with him. This I know personally and from numbers of men who were under his training. The fame and crowding honors which came so early to this young genius continued to come for more than a quarter of a century. Throughout he was the same modest gentleman of true science, glad at all times to accord to those so fortunate as to collaborate with him, the generous share of credit. In Schafer, Beevor, Semon, Gotch, Spencer and Ferrier he had loyal and staunch friends and co-workers. But ever he was the leader of them all, inspiring them to greater and more difficult achievements.

When he resigned as professor of pathology in the University College a Department of Experimental Neurology was created for him and he was given his old laboratory in which to continue his work. One of his colleagues writes: "There he was always to be found on certain afternoons of the week tackling fresh problems with undiminished ardour as the pages of *Brain* testify. None who has ever worked there under his aegis are likely to forget his infectious keenness and his unequaled generosity. All that he asked for was that men who came there should be workers; and they did come, from home, from the colonies, from America, Germany, Poland, France and elsewhere. It was a matter of indifference to him whether their researches were published with or without his expressed collaboration; all recognized that he was the leading spirit in the international coterie that labored in that odd-shaped and out of the way room, which to many of the younger generation of neurologists at home and abroad was a veritable Mecca."

At the Toronto meeting of the British Medical Association in July, 1906 he was selected to deliver the "Address on Surgery." A distinguished surgeon of New York, who was present, told me all the other sections were deserted to hear this great address. In the same week Horsley reported his studies with Robert H. Clarke on the differentiation of lesions of the cerebellar cortex from those of the cerebellar nuclei. Clarke had devised a most intricate stereotaxic instrument to facilitate this research. It was constructed so that an insulated platinum electrode could be passed below the cortex into any

of the planes within the nucleus. At first the cells in the nucleus were stimulated by gradually increasing degrees of intensity until absolute electrolytic destruction of every cubic millimeter of the nucleus had been thus stimulated and finally decomposed. The most elaborate tracings, records and photographs, microscopical and gross, were made and were exhibited with this report. It was the first employment of electrolysis in experimental physiology and in its original conception the greatest piece of work ever done in intracranial differentiation.

On their return to England in August I joined them for a fortnight in Norfolk at Westwick Hall. They were still animated by the thrill of their great discovery and I spent many nights far into the early morning hours reviewing with them this amazing work and examining their equally wonderful photography of it.

This quite compendious recital of but a few of the hundreds of original and epochal works and experimental demonstrations in the physiology and pathology of the brain and spinal cord made by this great master would be singularly inadequate were one to omit mention of one of the rarest examples of localizing precision and operative skill in the history of brain surgery. We are indebted to Stephen Paget for this graphic description, amongst a host of others. It was on the definitive impulses from the precentral gyrus. "What are the powers embodied in the precentral gyrus?" "What sensory impulses are accumulated in it rendering it serviceable to the movements of the upper limb?" He answers this question with a case from Queen's Square. The patient was a boy of fourteen with a case of violent convulsive movements of the upper limb; they had begun when he was seven; "He was in a distressing condition and was referred to me by Risien Russel with a view of arresting the spasm by an operation. Having stopped athenoid and clonic movements in two previous cases by the excision of the so-called motor area, I advised that the arm area in this case be delimited by excitation and then removed."

On March 20, 1908 Horsley exposed the right precentral and postcentral gyri, mapped out exactly, by electrical stimulation, the whole arm area (precentral gyrus) and removed it. The convulsive movements immediately stopped and more than a year later, at the time of the Linacre lecture, there was no sign of any return of them. He attributed this return of purposive movements chiefly to compensatory action of the postcentral gyrus. Tactile sensation, the "feel" of the muscles and joints (muscle sense, arthric sense), the appreciation of temperature and of pain, the ability to identify a point touched (topognosis) were impaired and there was profound impairment of the ability to recognize, by contact, the shape of solid objects (stereognosis). Thus, from this one case, Horsley was able to say that the gyrus precentralis is, in man, the seat of representation of (1) slight tactility; (2) topognosis; (3) muscular sense; (4) arthric sense; (5) stereognosis; (6) pain; (7) movement.

Many of his American students have testified to his personal charm both as friend and teacher. Ernest Sachs of St. Louis said: "I had the rare privilege of working with him from September, 1907 to December, 1908 . . . Of the many privileges that I have had in my life working with various great men, that year and a quarter I spent with him I prize as the most valuable and delightful I ever had."

Notwithstanding the many diverting influences which crowded into the life of this much sought after scientist his surgical activities continued unabated. Up to February, 1909 he had operated on 21 cases of that most rare disease, chronic spinal meningitis, without a single death. On November 22 he reported 149 operations on the Gasserian ganglion with 7 per cent mortality. Of the patients under fifty years of age none had died.

In the spring of 1902 he received the honor of knighthood. It came as a complete surprise to him and he never even knew who recommended him. It had been said by some that he had begun to lose interest in professional matters shortly before the war and devote more of his time to sociological and political affairs. But the honors and recognition of his great contributions to the science of surgery continued to pour in upon him from every quarter of the world. At thirty-three he was elected an honorary member of the American Surgical Association. At thirty-eight he was made a Corresponding Member of the Société de Chirurgie de Paris. The same year membership in the Athenaeum was given him without ballot and the Fothergillian Prize was awarded him by the University of London. Two years later he was elected to the Medical Council and a month later was appointed on the Senate of the University of London. The following year he was elected President of the Neurological Society of which he was one of the founders.

In 1900 and 1901 he was one of the active spirits in the reorganization of the British Medical Association and at the Swansea meeting he was Chairman of Representation. At the Toronto meeting of the British Medical Association, where he delivered the Address on Surgery, in which he gave a summary of twenty years of surgery of the brain and cord at Queen's Square, the University conferred upon him the degree of Doctor of Laws.

Early in 1910 he was elected a foreign associate of the French Academy of Medicine. In July of the same year he was elected corresponding member of the Royal Prussian Academy of Sciences. The same year he was made President of the Section of Surgery of the British Medical Association. In May, 1912 he was elected a member of the Royal Society of Science of Upsala in succession to Lord Lister. In December of the same year he was elected an honorary fellow of the Italian Society of Neurology. January 19, 1911, three years before the war, the Lannelonge Prize, just instituted by Professor Lannelonge of the University of Paris, was awarded to him, a gold medal and 5000 francs, "for the surgeon who in the previous ten years shall have done most for the advancement of surgery; to be awarded once in five years by a committee of surgeons, representatives of many nations, Great Britain and Ireland; the United States and Canada; South America, Japan and China; Italy, Spain, Portugal and Mexico; Scandinavia and Holland; Belgium, Germany and the Balkan States, one representative of each of these nations or group of nations." "Horsley received this unexampled honor," writes Paget, "the first Lannelonge Prize, from the hands of the President of the Société de Chirurgie. He spoke a few words of thanks and of compliment to Professor Lannelonge and said that his own country, which had long been under the influence of John Hunter's teaching, had later come under the influence of Claude Bernard, who had joined together physiology and surgery. 'That is what I have striven to realize. Unfortunately, if surgery advances with fair rapidity its practice progresses more slowly. That is because we are held in bondage by traditions from which we have difficulty in freeing ourselves.'"

Sir Victor was approaching the climax of a life of unexampled scientific effort. He had been acclaimed with a long procession of honors never before or since accorded to one of our guild. He had entered the medical service immediately upon the entrance of his country into war, had gone to France and shortly after been made executive Medical officer of the Gallipoli base with headquarters at Alexandria. After the fiasco at Gallipoli he volunteered for Mesopotamia, where the medical conditions were in appalling chaos. I had received a long autograph letter from him from Alexandria telling of the failure at Gallipoli and later another from Bombay describing the frightful conditions along the Tigris.

In grave apprehension of the hazard he was taking, his friends wrote and cabled, imploring him to leave the work in Amara in younger hands. These warnings came too late. They probably would not have been heeded in any event by this great spirit whose whole life had been a symphony of devotion to the welfare of his fellow men.

He was on duty at Amara up to the day before his death, when he had walked miles through the withering heat to attend a sick brother officer, and on Saturday evening, July 15, 1916 he was carried into the hospital. The next day his temperature rose to 107°, he became unconscious and on the evening of July 16, in a little hospital by the Tigris, on the burning plains of Mesopotamia, the name of the greatest surgeon in the history of England passed to the roster of the immortals.

These were some of the notable British masters who gave inspiration and impetus in the development of the art of surgery to the American student who visited them. Those of us whose study in the clinics of the Continent lent enrichment to our professional experiences may well remember the great obligation American surgery will always owe to our British teachers. No student of the genesis and development of an art can be oblivious to the achievements of the master minds whose constructive ideals created it. No student of the history of surgery can fail to accord to the great masters in surgical research in Britain the highest meed of tribute. They were the attendants on kings and princes, the companions of the most gifted minds in letters and in art and the noblest in the history of our guild.

BOOKS RECEIVED

All books received by The American Journal of Surgery are listed in this column as soon as possible after their receipt and this must be considered as adequate acknowledgement. Books that the Editor considers of special interest to our readers will be reviewed in a later issue.

Angina Pectoris. By Harlow Brooks, M.D. N. Y., Harpers & Brothers, 1929.

Arthritis and Rheumatoid Conditions. Their Nature and Treatment. By Ralph Pemberton, M.D. N. Y., Lea & Febiger, 1929.

Blood and Urine Chemistry. By R. B. H. Gradwohl, M.D. and Ida E. Gradwohl. St. Louis, C. V. Mosby Co., 1928.

Diseases of the Thyroid Gland. Ed. 2. By Arthur E. Hertzler, M.D. With a Chapter on Hospital Management of Goiter Patients. By Victor E. Chesky, M.D. St. Louis, C. V. Mosby Co., 1929.

Endocrine Diagnostic Charts. By Henry R. Harrower, M.D. Glendale, Calif., Harrower Lab., Inc., 1929.

The History of Hemostasis. By Samuel Clark Harvey, M.D. N. Y., Paul B. Hoeber, Inc., 1929.

The Injection Treatment of Hemorrhoids. By Charles Conrad Miller, M.D. Chicago, Modern Surgery Pub. Co., 1929.

Injection Treatment of Internal Hemorrhoids. By Marion C. Pruitt, M.D., L.R.C.P., F.R.C.S., F.A.C.S. St. Louis, C. V. Mosby Co., 1929.

Introduction to the History of Medicine. Ed. 4. By Fielding H. Garrison, M.D. Phila., W. B. Saunders Co., 1929.

Kyklos. Jahrbuch des Instituts für Geschichte der Medizin and der Universität. Vol. 1. Leipzig, Georg Thieme, 1928.

Physical Therapeutic Technic. By Frank Butler Granger, M.D. Phila., W. B. Saunders Co., 1929.

Proctology. A Treatise on the Malformations, Injuries and Diseases of the Rectum, Anus, and Pelvic Colon. By Frank C. Yeomans, M.D., F.A.C.S. N. Y., D. Appleton & Co., 1929.

Report on Fourth International Congress of Military Mecidine & Pharmacy, Warsaw, Poland, May–June, 1927. By Com. William Seaman Bainbridge, M.C.–F. Menasha, Wis., George Banta Pub. Co.

The Science and Practice of Surgery. Ed. 2, 2 vol. By W. H. C. Romanis, M.B., M.CH., F.R.C.S., F.R.S. and Philip H. Mitchiner, M.D., F.R.C.S. N. Y., William Wood & Co., 1929.

A Shorter Surgery. A Practical Manual for Senior Students. By R. J. McNeill Love, M.B., F.R.C.S. N. Y., William Wood & Co., 1929.

A Surgical Diagnosis. By J. Lewi Donhauser, M.D., F.A.C.S. N. Y., D. Appleton & Co., 1929.

Surgical Radiology. By A. P. Bertwistle, M.B., CH.B., F.R.C.S. Phila., P. Blakiston's Son & Co., 1929.

The Technic of Local Anesthesia. Ed. 4. By Arthur E. Hertzler, M.D., F.A.C.S. St. Louis, C. V. Mosby Co., 1928.

Le Tractus Thyréoglosse. Embryologie Topographique. Pathologie Chirurgicale. By G. Rémy Néris. Paris, Gaston Doin & Cie, 1929.

Ulcères de L'Estomac et du Duodénum. By Victor Pauchet, Gabriel Luquet and A. Hirchberg. Paris, Gaston Doin & Cie, 1929.

Why We Are Men and Women or Factors Determining Sex. By A. L. Benedict, M.D. F.A.C.P. N. Y., Allen Ross & Co., 1929.

The Writing of Medical Papers. Ed 3. By Maud H. Mellish-Wilson. Phila., W. B. Saunders Co., 1929.

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